T, APRIL 9, 1936 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

APR 1 ...

FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

1424
XXIX

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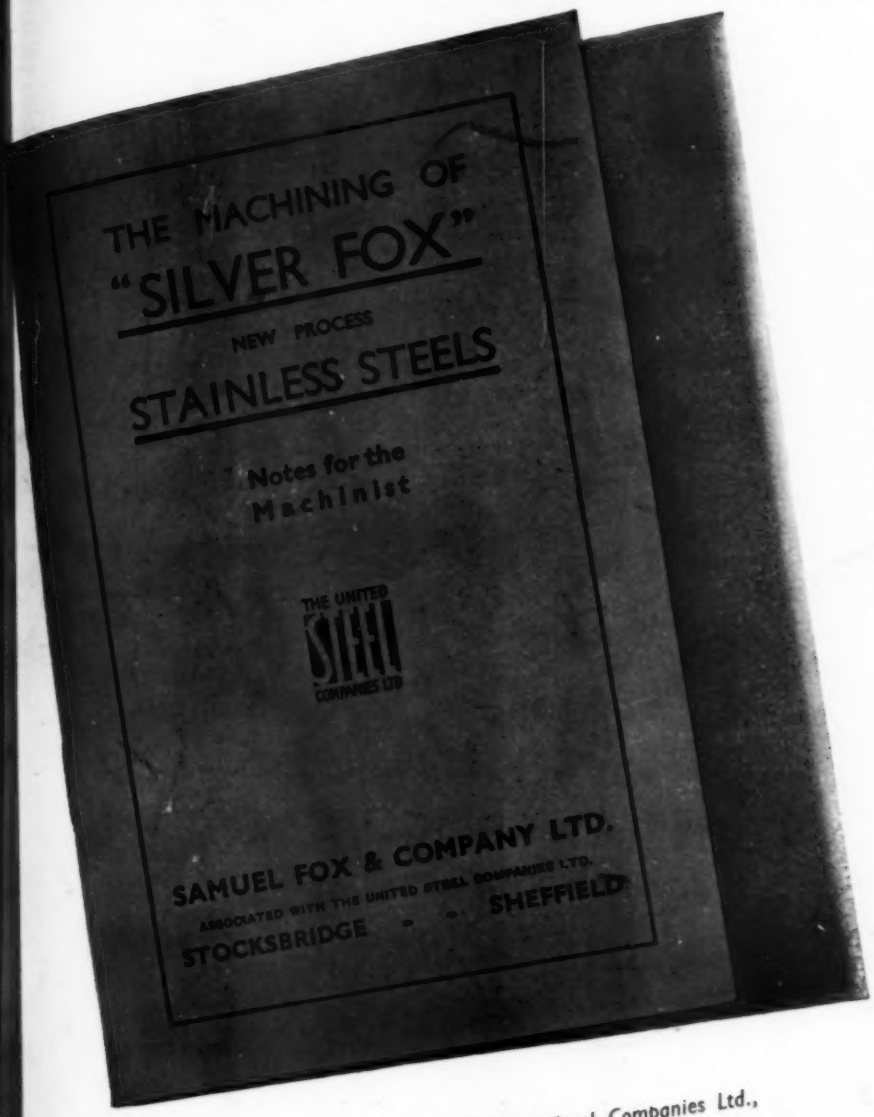

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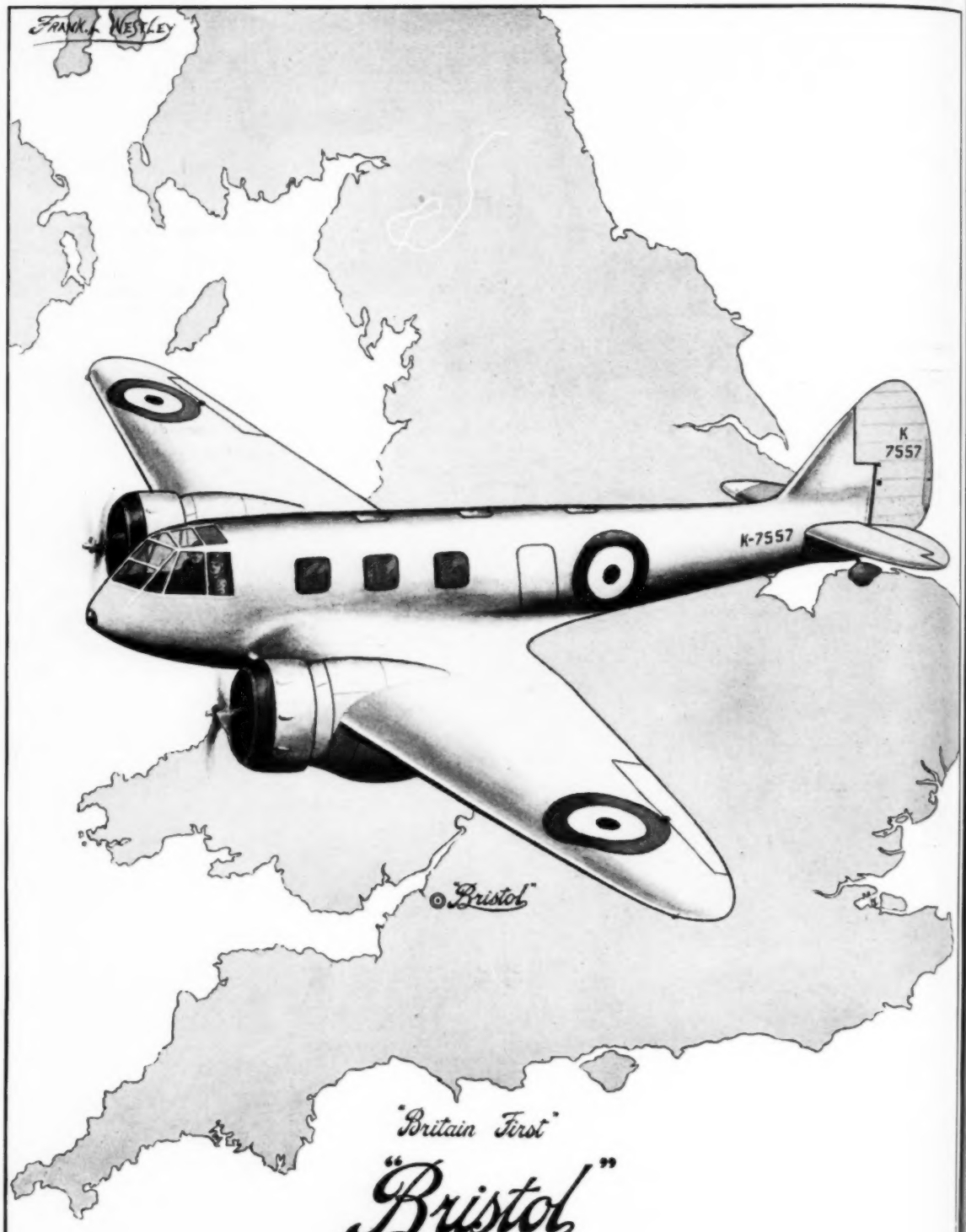

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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An International Necessity

IT would be a brave soul indeed who would dare to register a firm prophecy concerning air navigational developments which are likely to appear during the coming decade. Certain it is, however, that the pilot visualised by the least pessimistic of persons will still need to depend, of necessity, on scientific aids if services are to be continued in all weather conditions.

Whether these aids will consist almost exclusively of direct or indirect radio indications remains to be seen. At least two people in this country alone have advanced a very long way in their work on infra-red detectors, and these may eventually oust the short-wave approach system as we know it at present. But the need for approach guidance in bad weather is so great that we cannot afford to wait indefinitely for the "might-be's." The railway companies would have waited eighty years for a better system of signalling than the one on which they based their whole record of safety.

Meanwhile, the immediate necessity is for a rigid standardisation of approach systems in readiness for another winter. The work on short-wave beams has been progressing for many years, and finality has by no means been reached, but a halt must be called somewhere. To await perfection is to await the Millennium—and in that happy period, presumably, there will be no bad weather.

The necessary standardisation need not be one of method or of manufacture so long as the results are similar. The pilot—who, after all, must be the person to be primarily considered, since the safety of the passengers is largely in his hands—will not care who has developed the transmitter and receiver, or how they work, so long as his visual and aural signals are identical and are picked up at the same distance from and over the same area in relation to the airport which is being approached.

It is easy to say that the pilot can remember the fact that the airports at X and Y have beams of a different character and marker beacons at different distances from the boundary. Why should he need to remember? Goodness knows that he has enough to look after already, and the more there is to remember the more there is to forget—with tragic results.

The matter is not one for international rivalry, and is certainly not one for inter-firm rivalry. It is unfortunate, perhaps, that at least fifteen Continental airports are equipped or are being equipped with one particular system, so that we are already, to some extent, tied down to certain standards. That does not mean that we are necessarily tied to any one method of obtaining similar results.

The time, however, has surely come for a body such as the International Air Traffic Association, which has already decided on a nine-metre wavelength for the main beacon, to plan further into the future.

Sensible Uniform

WHEN King George V reviewed the Royal Air Force at Mildenhall last year wearing trousers instead of riding breeches and field boots, which then constituted the uniform dress of a senior officer on ceremonial occasions, the sound common sense of his late Majesty struck not a few observers. Unless a man is actually going to ride a horse, breeches and field boots are an abomination. Riding breeches which constrict the freedom of the knees are particularly unsuitable for men whose main duty is in an aeroplane. Getting into and out of an aeroplane, which sometimes needs to be done in a hurry, calls for full freedom of the knee joint. Puttees are an excellent garment for infantrymen, for they are suitable for all sorts of weather and country, but they are no more necessary for an aircraftman than they are for a seaman. Aesthetically, trousers may have little to recommend them, but as practical garments for airmen and seamen they are

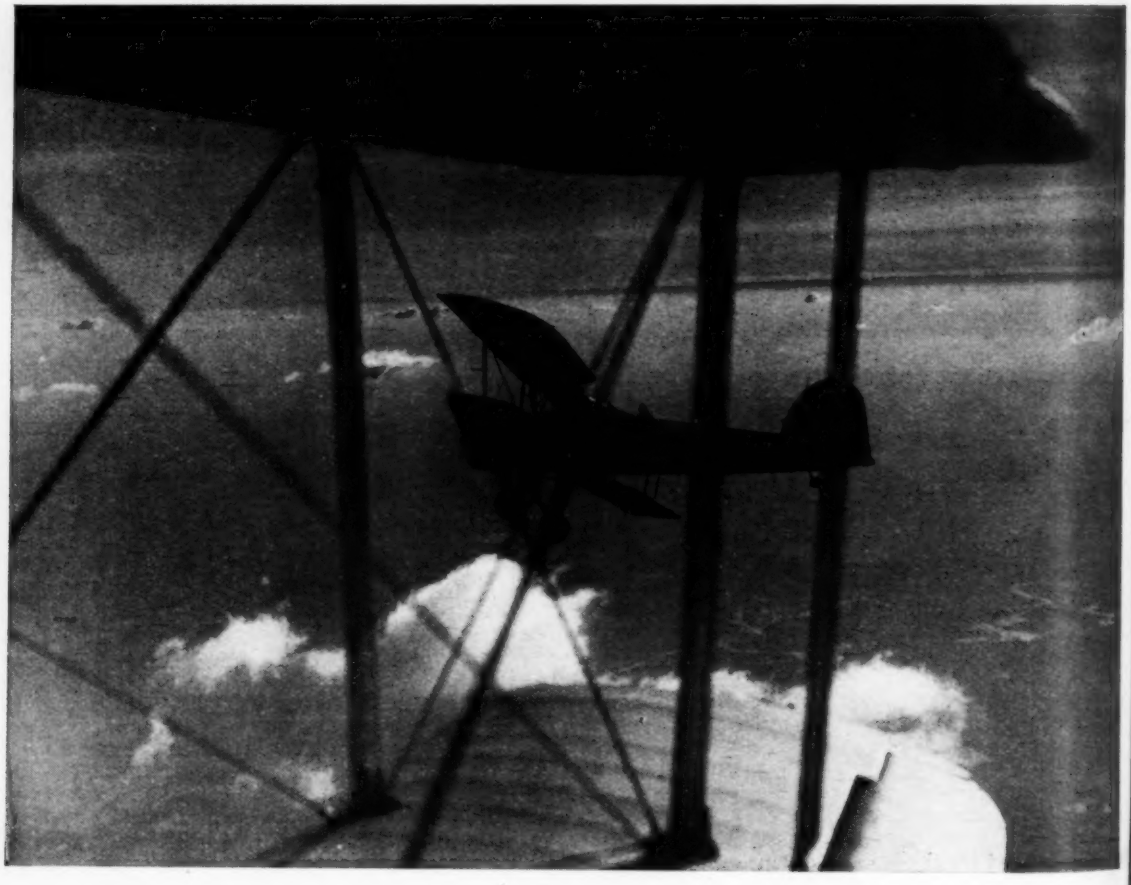
almost as good as "plus fours," and are the easiest of all to put on in a hurry.

If ease and quickness of putting on uniform is a consideration, then the change from the jacket which fits close at the throat to one with a collar and tie is not an improvement. Also, it will often look more untidy; but for all that it will probably be popular with the airmen. As for the field service cap, which was once universal in most branches of the Army but in 1914 was worn almost exclusively by the R.F.C., there are some things to be said in favour of it, and some things against it. It is useful to have a cap which can be put in the pocket when flying. The suggestion that it can be used as a flying helmet when the flaps are hooked under the chin need not be taken seriously. The Army used to say that it could be made into a Balaclava helmet, but it never proved useful for that purpose. It gives no protection for sun or rain or any sort of weather, being, in fact, quite as bad for such purposes as its ancestor, the Glengarry. But, and this is perhaps the greatest point of all, it is distinctive; and every man in any fighting Service will put up with a considerable degree of discomfort in his wearing apparel if only it makes him look completely unlike everybody else. If the postmen had been fighting men they would never have clamoured to discard their picturesque kepi for the common or garden peaked cap.

Barbarous Warfare

IT has been alleged that many Ethiopians, including non-combatants, are undergoing horrible tortures from the gas bombs dropped from Italian aeroplanes. The accusation may not be correct—it is very much to be hoped that it is not. At any rate, the reports, accompanied by a telegram from the daughter of the Negus, provoked spirited protests in both Houses of Parliament the other day.

Some people will say that this alleged atrocity is an argument for a prohibition by the League of Nations of all bombing from the air. *Flight* has always held that such a step would be not only useless but unwarranted. The bomber aeroplane is essentially a long-range gun, and is no more to be prohibited than is ground artillery. The use of poison gas, on the other hand, has been rightly forbidden by the 1925 Protocol of Geneva. At the moment the position is that Geneva agreements have been flouted by more than one Power, but it is yet too early to say that the flouting has been successful. The indignation roused in this country by the proposal of the Hoare-Laval plan to condone such flouting gives good hope that the League of Nations will triumph in the end. In that case gas bombing may be successfully banished from warfare.



FOR GENERAL PURPOSES AT SEA: A production-type Fairey Swordfish torpedo spotter reconnaisance shipplane (690 h.p. Bristol Pegasus III) during tests over Hayes. The Swordfish performs the duties of both the torpedo bomber and fleet spotter types. (*Flight* photograph.)

The Outlook

A Running Commentary on Air Topics

Slightly Slighter Planes

LORD SEMPILL'S remarkable flight from London to Berlin last week in a Super Drone lends weight to the special article on ultra-light aeroplanes published elsewhere in this week's issue of *Flight*. The author of the article examines briefly the history of light plane flying in this country, and from the results argues that if manufacturers had been alive to the possibilities, the low-power aeroplane would have been in extensive use to-day. If economical flying is to be introduced, the author of the article thinks the price should not exceed £350, and he thinks a cruising speed of 80 m.p.h. should be expected, while the fuel consumption should reach 35 miles per gallon. The engine needed, he considers, will be of about 30 h.p. cruising and with a maximum output of about 45 b.h.p.

Flt. Lt. Llewellyn's flight to South Africa has already shown that the Aeronca can be used for serious touring. Lord Sempill's Berlin flight has shown that even in very unfavourable weather, although not against a very strong headwind, the 17 h.p. Drone can also give a good account of itself. Both machines have demonstrated their ability to get into and out of fairly small fields when handled by experienced pilots. There is no reason to believe that either cannot be flown by a pilot of average skill, but the question arises whether that is sufficient to give rise to a large demand, or whether something very nearly "fool-proof" is necessary. If it is not, then the case for the cheap popular aeroplane seems to have been proved. If something even more simple to handle has to be evolved before a large number of people will take to flying, then much still remains to be done. But do not let us forget that, no matter how simple the aircraft may become to handle, navigational skill will still be required for cross country flights. The whole story is not told by solving the approach and landing problem.

Ground Training

SOME weeks ago our contributor "Indicator" suggested that ground training could never take the place of air training, but added that it was certainly possible, with an instrument such as the Reid aptitude indicator, to assess a pilot's capabilities with a very reasonable measure of success.

When, however, instrument flying is being considered, the problem is a very different one, and it does appear to be more than possible that a suitable device could be developed which would save a large number of expensive hours in the air. Last week a member of the staff was discussing the whole problem of instrument-flying training with an expert who had recently returned from a three-months' tour in the States, and during this tour he had spent several hours in the cockpit of the Link Advanced Trainer.

With this device a pilot can make an instrument and radio "flight" without leaving the ground, and his track over a predetermined route is mapped out on a chart which is under the instructor's observation. Needless to say, the problems of radio beam flying are very different from those involved in transport flying in this part of the world, but it would certainly appear that a similar instrument could very easily be developed to cover our methods and to give pilots the necessary practice in instrument flying.

Blind-approach Practice

SOONER or later, too, it will be necessary to evolve some means whereby transport pilots may accustom themselves to the signals and instrument indications during an approach along a short-wave beam so that, when the work is being carried out in real earnest, their reactions may be entirely automatic. This is not to suggest that "service" practice will not be necessary. Obviously it will, but operators will not be able to afford to give the pilots as much of this as they are likely to need for the accurate and reliable translation of the indications in all possible weather conditions.

The reading of and correcting from both blind-flying and blind-landing instruments is a purely mechanical procedure and, consequently, can be made equally well on the ground so long as flying conditions and indications are well simulated in any device which is used. The psychological effect of the knowledge that the pilot is safely on *terra firma* will be to permit the necessary concentration which is so very necessary during the initial stages of such instruction.

What the more conservative people may think of this modern worship of instruments is of small account, since they, too, know perfectly well that commercial flying is not possible without these instruments. At all times the indications of a properly designed and tested piece of mechanism are much more reliable than any human perception.

The Hindenburg

DR. ECKENER and Capt. Lehmann have done what was expected in taking the Zeppelin *Hindenburg* safely and smoothly across the Atlantic to Rio de Janeiro. The airship made no attempt at a record flight, and for political reasons she flew out of her way to avoid crossing France. She did not need to land and refuel at Pernambuco, but merely dropped a mail bag there and continued on her way. On approaching the capital she deliberately slowed down to avoid landing at night. Therefore, the covering of 6,875 miles in 100 hours is not to be taken as the best of which she would be capable in other circumstances.

Had a couple of such airships been available a few years go, Dr. Eckener might well have secured a practical monopoly of public patronage for this method of crossing the South Atlantic, if not also the North Atlantic. The *Graf Zeppelin* had to be used as a demonstration ship, and she nobly performed that function; but she was not fitted to establish a service on a commercial basis. Now the airship will have to face the competition of the flying boat, which has grown larger and far more comfortable than of yore, and which can now fly by night. The flying boat will be a most formidable rival to the airship, and the latter will only hold one real trump card in her hand, namely, spaciousness and consequently greater comfort. If these points do not suffice to attract a sufficient number of passengers to make an airship service a paying proposition, then the victory will lie with the aeroplane, and airships may have to press their claims on the navies of the world as long-range patrol vessels and as aeroplane-carriers.

It is rather sad to reflect that such a fine engineering feat as the production of the *Hindenburg* may have come to fruition just too late.

MODERN RACING AIRCRAFT

Some Notes on High-speed Machines which have Distinguished Themselves in Speed Events in Various Parts of the World During Recent Years : The Effect of Racing on Design in General

By H. F. KING

BRITISH export trade is in no small debt to those sportsmen who race English cars and motor cycles in international events and, in a lesser measure, to those who participate in races at home. By demonstrating our products they are acting as the best publicity agents the industries concerned could have, for it is generally agreed in these days that racing, be it of the road or track variety, can do a very great deal toward improving the quality of standard products.

There are few aeronautical events of an international character, and domestic air racing has achieved no great popularity except in the U.S.A. The Schneider Trophy contest is no more. The Coupe Deutsch races, with a few exceptions, have been among French machines. It takes an event with a lucrative purse to arouse international interest, for the great majority of firms the world over feel that they have no money "to play with." With one or two notable exceptions, those rich sportsmen of whom we hear so much but see so little seem to be able to generate only a lukewarm enthusiasm.

In pre-war days week-end "round the sticks" and closed-circuit racing achieved what seems now to have been a prematurely ripe success. Post-war attempts to popularise pylon racing in this country have brought about such financial and physical disaster that they have been counted not worth the candle. In these days we content ourselves with an annual private owner's field day—the King's Cup Race—a few events somewhat similar in character, but on a smaller scale, and one or two point-to-point races, which appeal only to a limited number of people.

But the industry has derived much benefit from racing in the past. Supermarines, no doubt, have profited from their Schneider experience of a few years back in the designing of their new monoplane fighter, and De Havillands will freely admit that their forthcoming four-engined transport is developed from their Comet long-distance racer.

There is but little, if any, more racing activity on the Continent than in this country. The Coupe Deutsch race, however, has served a distinctly useful purpose in stimulating the design of engines giving a relatively high output for a small capacity and of small single-seater monoplanes. Now that the French Air Ministry is interesting itself in the small and comparatively low-powered fighter, manufacturers with Coupe Deutsch experience can count themselves fortunate. The genesis of the high performance Caudron touring and sporting types and, to a certain extent, the twin-engined commercial machines, can be traced through the Coupe Deutsch event.

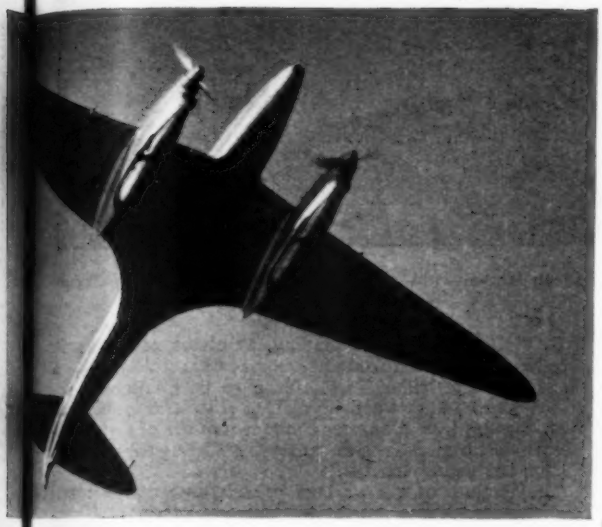
The American National Air Races provide ample scope for the private sportsman, and are conducted in a commendably efficient manner. Considering the speeds attained and the fact that quite a large proportion of the machines entered are home-made, the

number of accidents is not unduly high. Certain American manufacturers, particularly of engines, are richer in experience as a result of these races.

Britain's Contribution

Space does not permit, in this short review of racing types, to indulge in reminiscences of such magnificent British racing machines as the Schneider Glosters and Supermarines, or yet another description of the Comet—without a doubt the finest example of a long-distance racing type in the world. Neither shall we recall the victories of the Mew Gull—another reason for national pride. All the well-known British racers have had their due place in past numbers of *Flight*, together with such outstanding foreigners as the Macchi-Fiat used by Agello to bring the world's speed record up to 440.67 m.p.h., so it is proposed

The Laird biplanes achieved no little success in America a few years ago. This Wasp-powered model (left) broke the transcontinental record in 1931. On the right is Roy Minor with *Miss Los Angeles*, the successful Brown monoplane.



Perhaps the two best-known racing types in this country are the Percival Mew Gull (200 h.p. Gipsy Six) and the D.H. Comet (two 224 h.p. Gipsy Six R). The presence of R.A.F. markings on the Comet indicates that the Service can learn from a racing aeroplane. (*Flight* photographs.)

to examine some of the lesser-known, but nevertheless interesting, types produced abroad.

There is no better-known make of French racing aeroplane than the Caudron, and there has been no more successful racing Caudron than the C.460. Until Howard Hughes, the young film producer, came into the field a few months back with his new monoplane, this machine held the world's landplane speed record. The pilot was Delmotte, and the speed 314.2 m.p.h. The C.460 was an unusual aeroplane in a number of respects. Its six-cylinder air-cooled Renault engine gave a maximum of only 370 h.p. (the Hughes monoplane which did 352 m.p.h. had about 1,000 h.p.), and its span was actually less than the length of its fuselage, the measurements being 22ft. 11in. and 23ft. 4in. respectively. The machine was of wooden construction, and, in its record-breaking form, had a retractable undercarriage. Its general lines have been preserved to quite an amazing extent in the two-seater Rafale which does 196 m.p.h., the 200 m.p.h. C.580 aerobatic trainer, and the twin-engined Goeland and Typhon.

The great majority of American racing machines have air-cooled engines—mostly radials—and it is in the U.S.A. that some of the most interesting applications of this type of unit to racing aircraft are to be seen. There is, however, or rather was, one French radial-engined type—the Potez 53, which won the Coupé Deutsch Race in 1933—which also provides a forceful answer to those who are so old-fashioned as to think the radial unsuitable for high speed aeroplanes. This particular type had a Potez radial of only 250 h.p., but was capable of 236 m.p.h. The wing loading, at 25.6 lb./sq. ft., was 2.2 lb./sq. ft. lower than that of the Caudron C.460.

Farmans took a bold step a few years back when they designed a racing monoplane (actually there were two versions—one with a 165 h.p. Renault and one mounting the 400 h.p. Farman) with a single-wheel undercarriage. This wheel was arranged to be retracted in flight into a fairing, and lateral stability was provided on the ground by wing-tip skids.

The Fastest Landplane

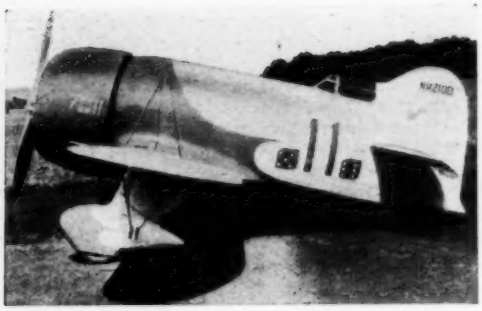
Although it has not yet taken part in any sporting events, the new Hughes monoplane may well be included in the racing category. Like the Caudron C.460, whose record it has beaten, its span is less than the length of its fuselage. Its wing loading is about 40 lb. (only 1 lb./sq. ft. less than that of the Supermarine S.6B and Agello's Macchi-Castoldi), but its landing is assisted to some extent by trailing-edge flaps which these seaplanes lacked. The Pratt and Whitney Company supplied a specially "hotted-up" Twin Wasp Junior two-row radial for the record attempt. Normally, this type of engine, which is standard equipment in the U.S. Army and Navy, is rated at about 750 h.p., but Mr. Hughes' engine was boosted to give about 1,000 h.p. One of the new Hamilton-Standard constant-speed airscrews assisted in the take-off. At the moment this machine is being modified, according to one report with a view to attacking the coast-to-coast record.

The Hughes monoplane, seen here with its 1,000 h.p. Twin Wasp Junior uncowled, holds the world's landplane speed record with 352 m.p.h.

In general appearance the Hughes monoplane resembles somewhat a miniature Vultee transport, but its undercarriage is proportionately stilty.

The Howard DG-A6 *Mister Mulligan*, perhaps the most successful of last year's crop of American racing machines, is even more strikingly conventional in appearance, being

On the left is Mr. "Jimmy" Haizlip with one of the successful Travel Air "R" monoplanes of a few years back. One was seen over here in the hands of Capt. Frank Hawks. The Wedell-Williams (right) was a favourite mount of Colonel Roscoe Turner, among others.



The "teardrop" fuselage of one of the famous Hornet-powered Gee Bees shows up well in this view.

An American long-distance racing type: the Bellanca *Irish Sweep* (Twin Wasp Junior).

a high-wing, strut-braced monoplane with a fixed undercarriage. *Mister Mulligan* was designed by Mr. Ben Howard, who has appeared at quite a number of the National Air Races, where he put up some brilliant performances with his little low-wing monoplanes *Mike* and *Ike*. Last year *Mister Mulligan* won the Bendix Trophy for a race between Los Angeles and Cleveland, and the Thompson Trophy for closed circuit racing. Its cabin is large enough to seat four people, and Mr. Howard was so encouraged by the results he obtained that he is building a version suitable for commercial work or private ownership.

Mister Mulligan's engine is a Pratt and Whitney Wasp nine-cylinder radial of the "E" series, and is generally similar to the Wasps used in a great number of standard American fighters. Its normal rating is 550 h.p. at 11,000ft., and during the Bendix Race the machine was flown at heights between 15,000 and 20,000ft. The wing area is only 137 sq. ft., but, even so, when taking off for the Bendix race at an all-up weight of 5,355 lb., the machine left the ground in 1,500ft., and climbed at about 2,000ft./min. without exceeding the permissible 550 h.p. for take-off.

Special Fuels

The fuel used for take-off was of 92 octane number, but for cruising the main supply of 87 octane was brought in. For the Thompson Trophy race fuel of 100 octane number was used throughout.

Mr. Howard reports that *Mr. Mulligan* has been dived up to an indicated air speed of 435 h.p. at 12,000ft. with hands and feet off the controls. There was no sign of flutter.

The series of low-wing monoplane racers built by Mr. Lawrence W. Brown is also well known by regular visitors to the National Air Races. During 1934 two machines were built, both structurally similar, but fitted one with the 300 h.p. Menasco Buccaneer, and the second with the 225 h.p. Menasco Pirate. Maximum speeds were claimed to be 270 and 240 m.p.h. respectively. The span was only 19ft. 3in., but the wing loading, at about 21 lb./sq. ft. for the more powerful model, was comparatively low. A two-seater on similar lines is soon to be marketed.

The Miles and Atwood Special, another Brown product, with the 225 h.p. Menasco, broke a number of light aeroplane speed records and generally distinguished itself during the same year.

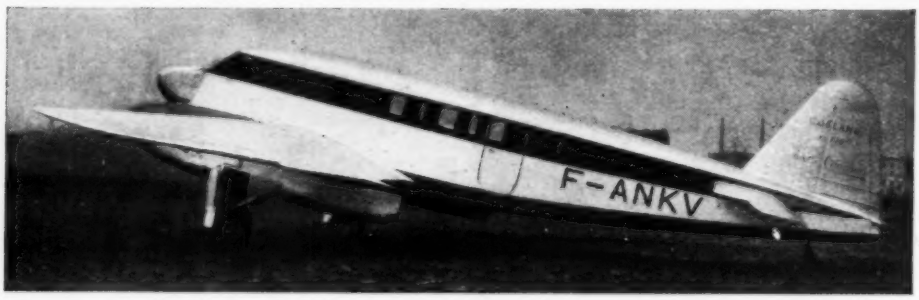
The mounts of the various private entrants in recent National Air Races are far too numerous to permit comment on each type. Quite a few have had engines designed originally in this country, among others the Cirrus and Pobjoy, although the Menasco seems to be favoured these days in the low-powered classes. The Gee Bees and Wedell-Williams types are now generally regarded as back numbers, and the next series of races should bring forth a number of refreshing new designs.

Sporting Transports

Single-engined transports like the Lockheed Altair and Orion, Northrop Gamma, and Vultee—all capable of speeds of the order of 220 m.p.h.—have been used as racing mounts and long-distance speed-record breakers, flying, of course, under the "R" licence, which usually means that they are loaded to considerably more than their normal all-up weight.

The latest example of a conversion from a standard commercial model is the Northrop Gamma used by Howard Hughes to break the American transcontinental record a few weeks ago. This was actually the machine which Miss Jacqueline Cochrane intended to fly in the England-Australia race, but the original liquid-cooled supercharged Curtiss Conqueror was changed for one of the new "G" series Wright Cyclones which gives 930 h.p. for take-off. Hughes' average speed for the trip was 263.5 m.p.h., but on one section, between Indianapolis and Columbus, Ohio, he did 295 m.p.h. He beat Colonel Roscoe Turner's record by 35 minutes. The force of the tail wind which must have assisted is unrecorded.

The Gamma, although carrying "R" registration, was basically a stock model which serves to emphasise the fact that the long-distance racer of to-day may be quite a close relation to the transport or bomber of a few years hence.



The lines of Coupe Deutsch racing Caudrons have been preserved to a noticeable extent in the new Goeland light transport.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

MICHEL DETROYAT has dived the 300-m.p.h. Morane-Saulnier 405 fighter at 450 m.p.h.

Ominous item in a *Pou-du-Ciel* catalogue: "Incidents gauge, 9s. 6d."

More than 3,000 workmen are engaged in the construction of the Short Empire flying boats.

The first of these machines should begin its trials at Rochester towards the end of this month.

Dr. Eckener has presented 200 books to the English branch of the All Peoples' Association.

The 240 m.p.h. Breguet Fulgur transport, shown in mock-up form at the last Parish Show, is now flying.

The Polish Air Force has ordered thirty P.Z.L. P.24 single-seater monoplanes, each armed with two 20 mm. *canons*.

Hispano have produced a new engine in their "Y" series giving 920 h.p. at 11,800ft. The compression ratio is 7 : 1.

One thousand pounds has been presented by the South Australia Centenary Committee for a Sydney-Adelaide air race in December.

Twenty-five Years Ago

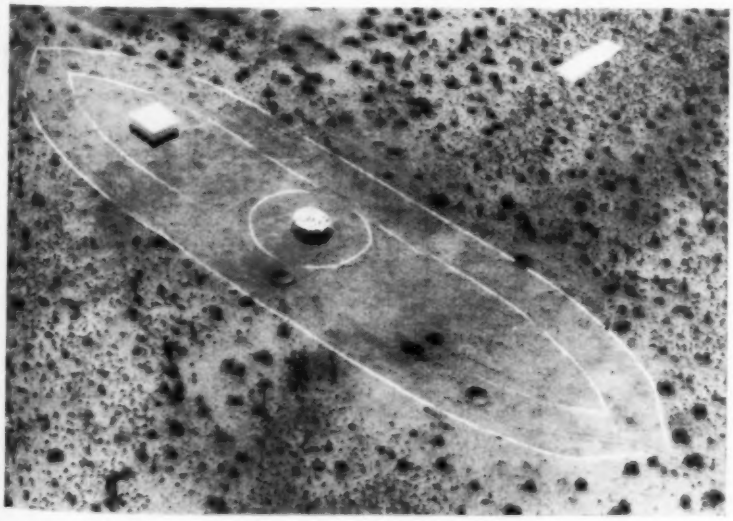
(*From "Flight" of April 8, 1911.*)

"In order to allow of trials being carried out with the airship 'Suchard,' Herr Brucker has postponed the proposed voyage across the Atlantic. In view of the proposed system of sprinkling the envelope with water to counteract the effect of the sun's rays, it is felt that the apparatus should be thoroughly tested."

PROOF: Lord Sempill's flight to Berlin (11 hours) and back (9 hours) in a B.A.C. Super Drone must have given a jolt to those who habitually scoff at ultra-light aircraft. Lord Sempill is seen at Croydon with Mr. Kronfeld (right). Comment on this flight appears on pages 369 and 375.

Guarding the Midlands

It has been decided to convert the 5th Batt. the York and Lancaster Regiment (Territorial Army) into an anti-aircraft unit to protect Midland industrial centres.



A PAINTED SHIP . . . This "battleship" on the famous Muroc Dry Lake, California, is a target for U.S. Army Air Corps machines. The box affairs represents a magazine and a funnel. Note the 300 lb.-bomb craters.

Mrs. Mollison's Flight

Mrs. Amy Mollison took off in a Percival Gull from Gravesend at 5.30 a.m. on Friday morning to attempt a record flight to the Cape. She reached Colomb-Bechar at 3.45 p.m., but in taking off again damaged the undercarriage of the Gull. At the moment it seems uncertain if she will proceed to the Cape.

Another Cape Bid?

After their marriage last week Mr. H. L. Brook (of Australia flight fame) and Mrs. Brook left Heston in a Jersey Airways machine to spend their honeymoon in the Channel Islands. Mr. Brook said he intended to collect a Praga Baby aeroplane from Prague early this month and fly it from England to the Cape.

American Exports

There was a marked decline last year in the export sales of American aeroplanes, engines, components, and allied productions, the shipments from the United States attaining a total of only £2,858,168 as compared with £3,532,590 in 1934.

De-icing on the Grand Scale

Following a sudden change of temperature the ice carried by the principal rivers is causing serious obstruction to shipping in Solec, Poland. Aeroplanes are being used to drop bombs on the giant iceflows as the most effective method of combating the serious menace.

THE SCHWARZ AUTOMATIC V.P. AIRSCREW

Extreme Simplicity the Feature of Fully Automatic Two-pitch Design : Three-pitch Type to Follow : Use of Wooden Blades

THE Schwarz variable-pitch airscrew hub has been designed to provide a simple and reliable limited solution, pending the emergence at some future date of a complete solution of the problem of an infinitely variable-pitch airscrew to fulfil ideal requirements. Even if and when the latter becomes generally available, predict the designers, it is certain that a substantial proportion of aircraft will for many years continue to be equipped with a similar variety, such as the Schwarz automatic hub, for convenience and economy.

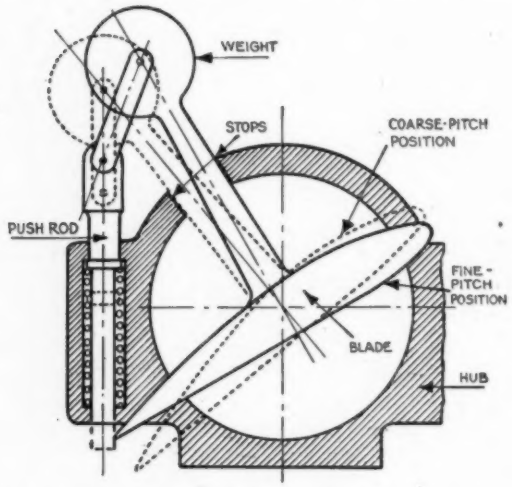
Two-position Simplicity

The Schwarz variable-pitch airscrew hub is an automatic mechanism giving fixed positions to the blades; at present there are two positions only, corresponding to the requirements respectively for (a) take-off and climb, and (b) for normal flight. In either position the airscrew is stable, while the change-over occurs automatically and positively in both directions at predetermined airscrew speeds. By limiting the requirements in this way to the most important needs it has been possible to simplify the design exceedingly and to make the mechanism independent of the effect of external disturbing influences, such as friction, displacement of centre of pressure, distortion of blades, etc.

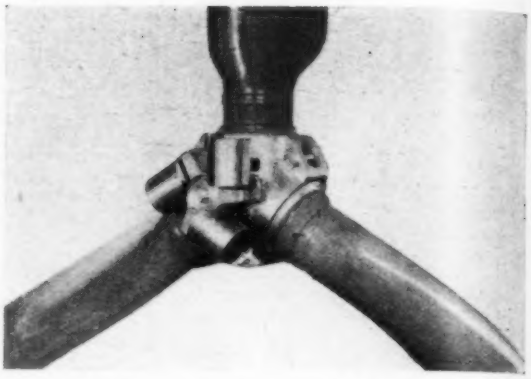
The principle of the mechanism is illustrated in the accompanying diagram. Each blade is mounted rotatably in the hub; attached to the blade is an arm carrying a weight. When the airscrew is at rest a spring, actuating the weight-arm through the medium of a push-rod and link, pushes the blade into the position of minimum incidence, with the arm against a stop on the hub. When the airscrew is in motion there are two forces acting on the blade, a moment exerted by the spring, which is independent of the speed of rotation, and a centrifugal moment which increases as the square of the speed.

Take-off and climb proceed at the minimum incidence and at rotational speed gradually approaching the maximum permissible speed of the engine. On the machine changing over from climbing attitude to level flight, the speed of rotation increases and oversteps the point at which the two opposing moments acting on the blades are exactly balanced. The centrifugal moment then overcomes the spring moment, and pushes the blade into the position shown dotted (maximum incidence) with the arm against the opposite stop. The axial distance of the weight, and consequently also the centrifugal moment, are thus increased. At the same time, however, the spring moment, in spite of the increased tension of the spring, is reduced, because the altered angle of the link reduces the effective leverage. Thus the change-over is quite positive from one stable position to the other, and the engine can then be throttled back quite considerably without causing the mechanism to reverse the blade position. Thus the airscrew will be kept in the position of maximum incidence required in cruising flight. Not until the engine is throttled back to the extent required for preparing to land will the mechanism change over, when the blades will revert equally positively to the minimum incidence position, in which they will be ready for a fresh take-off or climb, e.g., in the event of the pilot reopening the throttle after an unsuccessful attempt to land.

Design work is in progress with a view to the provision of a third stable position of the blades, suitable for high-altitude cruising.



Studied in conjunction with the text, this diagram clearly shows the operating principle of the Schwarz hub.



The Schwarz automatic v.p. airscrew hub, carrying wooden blades prepared by the makers' patented process.

German Experience

The simplicity of the arrangement has resulted in the desired maximum reliability; it is stated that even in the unlikely event of damage to the mechanism (broken spring, seizure, defective bearing, or the like) safety is not impaired, and the worst that could happen would be to continue a flight with an unfavourable blade setting.

In Germany the Schwarz variable-pitch airscrew—which, incidentally, can be adapted to the *moteur canon*—has been designed and tested for several types of engines. The first tests were carried out on two-bladed airscrews for the 240 h.p. Argus AS 10 engine, and on three-bladed types on the 660 h.p. Siemens SAM 22 B engine and the 730 h.p. B.M.W. VI (geared) engines. D.L.H., too, have used this airscrew on Jumo 5 Diesel engines. In addition, the Schwarz Company have production orders in hand for equipping the Hirth HM 8 U engine, B.M.W. Hornet, B.M.W. VI (direct drive), and other engines up to 900 h.p.

Though the Schwarz V.P. hub may, if desired, be fitted with metal or any approved type of blade, those so far built have been equipped with Schwarz patented wooden detachable blades of the type described in *Flight* of June 6, 1935.

The low weight of these blades considerably reduces centrifugal forces on the bearings; moreover, all forces exerted by the blade are taken up by a single bearing in which a novel method of elastic preloading is employed to obviate alternating stresses, which are highly undesirable in ball or roller bearings. Schwarz lightweight detachable blades are made in England by the Airscrew Co., Ltd., Weybridge, under licence. Incidentally, the Schwarz process is now the standard finish for all wooden airscrews for the Royal Air Force.

In a paper read before the R.Ae.S. recently (see *Flight* of February 6, 1936) Dr H C. Watts described the Schwarz process of protection, and also the method of compressing the blade root to prevent play developing in the steel sleeve.

AN "ULTRA-LIGHT" RECORD

Lord Sempill's Fine Out-and-Home Flight to Berlin in a 750 c.c. Douglas-engined Super Drone

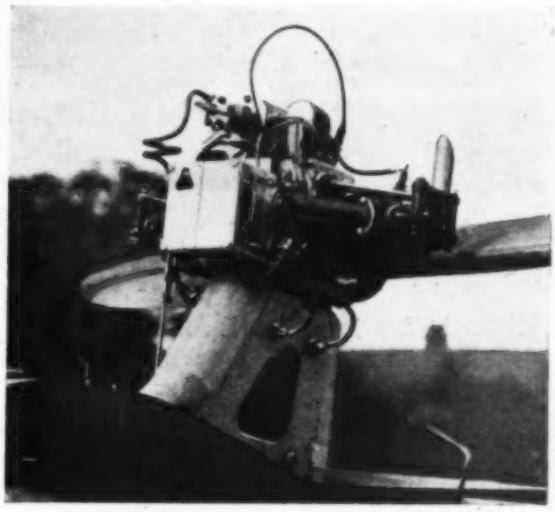
THE flight from Croydon to Berlin and back last Thursday week by Lord Sempill in a B.A.C. Super Drone with a 750 c.c. (19 h.p.) Douglas flat-twin engine is of outstanding interest, especially since it marks the breaking of a long-standing F.A.I. record in Category 4 (single-seaters weighing less than 200 kg. (440 lb.), non-stop distance in a straight line). The previous holder of the record was the French pilot Fauvel, who, on September 10, 1929, flew an A.B.C. Scorpion-engined Mauboussin a distance of 527 miles from St. Inglevert to Pau. Lord Sempill has handsomely improved on the old figure by securing a straight-line figure, from Croydon to Berlin, of 570 miles. Actually, since he travelled *via* Calais and Hanover, his mileage was greater than this—round about 600 miles—though it cannot be counted for the straight-line record. He covered the distance in exactly eleven hours, which indicates an average speed of 54.5 m.p.h. The Drone was equipped with a 16-gallon fuel tank—the only departure from standard—and at cruising revs of 2,900 the Douglas engine consumed only 1¼ gallons per hour; thus the distance was covered on less than 14 gallons, and two gallons were left in the tank.

Mast-dodging

The most spectacular aspect of the flight, however, was undoubtedly the extremely bad weather on Thursday. In spite of a promising forecast on the previous day "the ceiling was on the floor," and Lord Sempill had to make his way out from Croydon through the valleys. Over the Channel he flew just above the water, and once had to turn suddenly to avoid collision with a ship. Things improved slightly at Amsterdam, but at Hanover there was a tropical deluge.

Lord Sempill was received at Tempelhof by, among others, Ernst Udet, the famous German pilot, and Baron Von Neurath, the German foreign minister. The latter, in a welcoming speech, said that flights as this would do much to bring the sportsmen of European nations together. Lord Sempill lunched at the German Air Ministry.

On Saturday, without formalities, he climbed into the Drone and set off for home, though this time not in search of further records. The great meteorological feature of Saturday was a north-east gale—too much on the beam to give real assistance to the Drone, but far enough astern to enable it to make the return journey in only nine hours. Since he was not attempting a non-stop journey, Lord Sempill landed at Canterbury (in a fifty-yard field) to call on friends. His Channel crossing on this return trip was an even more emotioning business, for he flew only a very few feet above the waves, not because of bad visibility, but in order to gain some respite from the gale, which was gusting at up to 70 m.p.h. at Lympne. He said that he had actually been able to feel the little Drone lifting to the wind currents deflected from each of the big rollers in the Channel. This return trip, which, as already remarked, was achieved in nine hours, totalled between 550 and 560 miles in distance.



The 750 c.c. Douglas engine of the type used in the Drone. (*Flight* photograph.)

The equipment of the Super Drone included the following: Stanavo fuel, Vacuum oil, K.L.G. plugs, B.T.H. magneto, Zenith carburetter, Goodyear tyres, Short and Mason instruments, Korrect petrol gauge, airscrew by the Airscrew Company, Rumbold seating, Demec navigation lights, A.C. Sphinx fuel pump, Dove Cloudring.

A photograph of Lord Sempill appears on p. 373.

General Aircraft Meeting

AT the first annual general meeting of General Aircraft, Limited, held at the company's offices at Hanworth last Thursday, the chairman, Sir Maurice Bonham Carter, K.C.B., K.C.V.O., pointed out that the trading loss of £29,987 occurred almost entirely during the first nine months of the company's life, before the works and plant were completed for full commercial production, and that delays due to weather were partly responsible. Delay also occurred in the production of the prototype S.T.18, the delay being partly due to a policy which would ultimately result in more economical cost of production. The machine, Sir Maurice said, had a maximum speed of well over 200 m.p.h., and a cruising speed of 190 m.p.h. at 10,000ft., a performance which justified the claim that the machine was "Britain's fastest air liner."

Mr. E. C. Gordon England, managing director of General Aircraft, Limited, said that prices had been fixed for the contract for Hawker Furies secured by the company, and Air Ministry officials had expressed satisfaction with the progress that had been made. If they did not disappoint the Air Ministry they thought they were entitled to obtain further business while the present expansion went on. The price for the Fury contract was such that the company could make a reasonable profit.

Captain H. M. Schofield, the retiring director, was re-elected, the auditors were reappointed, and the meeting closed with a vote of thanks to the chairman and directors.

The New Supermen

"Flying Adventures," by Walter Mittelholzer (Blackie and Son, 10s. 6d.).

LIVING in a world wherein history appears to be about to repeat itself yet again, and surrounded on all sides by citizens who are being educated to think of the aeroplane only as a means to destruction or self-extinction, I am still cheerful enough to believe that this latest form of transport will eventually bring good rather than evil.

One has only to chat with the pilots of half a dozen nationalities who assemble daily at Croydon to realise that the flying man is one of a new international race. He interests himself little in the wranglings of diplomats or in the mouthings of demagogues and would so much rather discuss ways and means for improving the air routes of the world.

Walter Mittelholzer himself is one of the perfect examples of the men of the new era. His life is wrapped up, for the present at least, in the work of making Swissair a most efficient and up-to-date organisation, and it would be a phlegmatic individual who was not fired by his enthusiasm. That Mittelholzer is a keen and efficient amateur photographer is obvious from a study of many of the Alpine photographs used by Swissair for their brochures, and *Flying Adventures* is copiously illustrated with the sort of pictures which appeal to flying people. For these alone the book is worth perusal. Spitzbergen, Persia, Africa, the South Atlantic—where you will. Even Abyssinia.

H. A. T.

Private Flying

Topics of the Day

This Landing Business

AFTER a good deal of heavy thinking and some discussion I am still unable to explain why and how the pilot knows exactly when to ease the control column back for a three-point landing. I know that normally intelligent people may take anything from four to fourteen hours of dual instruction before being permitted to go solo, and that at least 80 per cent. of this instructional time is involved in this curious business.

My instructor used to tell me that the "sinking feeling" would eventually be apparent to me, but even after I had been pushed off by myself I was still quite capable of dropping the oddly unprepossessing affair on its wheels. The only difference between these landings and some which the patient instructor had had to deal with was that I had learnt *not* to pull the stick back just as soon as I felt the impact with Mother Earth—in fact, I had learnt to ease it forward very slightly and quite momentarily.

"Right Back"

SINCE the normally healthy pilot can usually manage to pull off a "three-pointer" with any machine, whether with a light or with a heavy elevator, the knowledge cannot be connected entirely with control "feel."

The perfect instructor—the word "perfect" implying one who does not manifestly keep his hand and feet on the controls—knows exactly when it is safe, after a series of "back a little—hold it!" variations, to use the exciting words "Right back!" so, obviously, *he* feels that the machine must then be ready to land. It is easy to say that a lack of buoyancy is evident; this lack is progressive and varies with different machines.

Probably the truth is that this instinct is the combined effect of a whole series of clues which are being noted by the subconscious mind. One's body registers the fact that the aeroplane is sinking and that it is becoming increasingly difficult to keep it in the air; one's eyes register the definite slowing down of the turf; and one's hands and feet proclaim the fact that the controls have become entirely loose. Perhaps the moment is finally discovered when it is realised that a backward twitch on the stick no longer results in an imperceptible ballooning effect and the stick is instinctively moved faster and farther in a final effort to prevent the impact which one knows to be inevitable.

The mystery has its counterpart in the control of that simpler means of transport—the bicycle. Can anyone tell me how the rider negotiates a bend or how he originally learnt to balance this contrivance by means of a control which moves in a quite different plane from that in which he is tending to fall? The human animal is certainly simian in his muscular dexterity even if he sometimes shows sub-simian characteristics in his tribal affairs..

Simplification Necessary

NEVERTHELESS, however simple the performance may appear to the expert, it is high time that our designers seriously set about the business of reducing the difficulties both in the landing and in the approach. Not in order to encourage a host of remarkably inefficient people to take kindly to the idea of private ownership, but merely to reduce the number of minor casualties which occur during the critical phase of the return to earth.

Only last week I watched a perfectly good transport aeroplane, in the hands of an experienced pilot, overrun a reasonably large aerodrome and sit quite gently on its expensive nose. If this machine had been designed to approach steeply and safely at a speed little in excess of its stall it would not have run furiously past the boundary lights and down a steep dip into a sort of imitation stone quarry. And if it had not been designed only for the traditional three-point landing it might not have gone over on its nose as soon as the undercarriage encountered a certain amount of resistance. The tail wheel would, so to speak, have been under the nose. Incidentally, I have only flown or flown in one machine with which it was safe to apply the brakes really hard immediately after the landing.

Facing the Facts

TALKING about nose wheels, I have yet to discover how the American pilots land those Vidal-inspired machines for the private owner. Presumably, they make some sort of "wheely" landing and then push the stick forward in order to keep the machine on the ground and to obtain ground control, which, in one case at least, is provided by the nose wheel. On the majority of English aerodromes it would still be necessary to do a semi-three-point in order to get the speed down as much as possible before touching. One would imagine that they take themselves off. In other words, the pilot merely lets his machine gather speed and then drops the tail (if there is one).

Whatever may be thought of these contrivances, there are certainly times when I think that the conventional aeroplane is the maddest contraption ever devised. Consider the take-off. One balances a rapidly accelerating vehicle on two wheels (which form a single pivot in the fore and aft plane) by means of a vertical lever. Meanwhile, it is highly unstable directionally, and one keeps it straight by means of a bar which is moved by one's feet.

This same principle is rigidly followed even in the very largest aeroplanes, which have, in addition, a series of engines laid out sideways in a row. When the unfortunate pilot opens up, any one of these engines may give more power than the others, and the resultant swing is fought in the initial stages by using the throttles as an organist uses his stops. Did you ever? INDICATOR.

FROM the CLUBS

Events and Activity at the Clubs and Schools

CASTLE BROMWICH

NEW members of the Midland Aero Club include Messrs. H. Reynolds and A. C. Edwards (flying) and Mr. A. G. Clutten (ordinary). The flying times for the week ending April 3 were 14 hr. 45 min. dual and 10 hr. 40 min. solo.

C.A.S.C.

Five members attended at Fen Ditton on Sunday. All of them flew and all but one went in formation to Broxbourne. Mr. H. Sale passed his "A" licence tests.

BRISTOL

The flying time for March was 110 hours, and the total for the year ending March 31 was 1,270 hr. 35 min. Mr. A. Bailey and Mr. J. Wingate-Hill have started on their "B" licence courses.

LONDON

The London Aeroplane Club has added to its fleet another Hornet Moth—a square-tipped model with Reid and Sigrist turn indicator. It is possible that the first Hornet will be fitted with the new type wings. The flying time for last week was 61 hr. 35 min. Messrs. W. L. Thurgood, J. M. Hornsby and L. Lewis became members.

WEST MALLING

March's flying total was 78 hr. 40 min. Messrs. A. J. Moffat, C. E. Mercer and L. J. Pinion became members. Club machines have made visits to Southampton to see the *Queen Mary*. Mr. E. W. Kennett, a club member, arrived at West Malling with his D.H.53, which he has completely rebuilt. Mr. J. K. Lawrence has taken delivery of a Puss Moth.

BORDER

The drainage scheme on the aerodrome is gradually creeping up to the centre from the south. In case it should interfere with the services which resume this month, it has been decided to curtail and, if necessary, stop the scheme until later in the year. Messrs. G. Bowman, T. H. Little and H. Blair have become flying members. A large number of machines, presumably flying to and from the Clyde where the *Queen Mary* was to be seen, have used Carlisle as a refuelling point.

LEICESTERSHIRE

Ninety hours ten minutes flying was done by the Leicestershire Aero Club during March. The Hon. Miss F. P. Tollemache took her "A" licence, and Mr. C. T. J. Cripps went solo. The Club's annual dinner and ball was held at the Grand Hotel, Leicester, on March 6 and about 250 members and friends attended. There was night flying on Saturday, March 28. New pilot members are: The Hon. Miss F. P. Tollemache, Miss M. France, Messrs. J. A. Wagstaff, H. M. Bowes-Lyon, R. E. Polendine, D. R. Oram and Lt. Cdr. W. C. Skyrme (R.N. Retd.).

CAMBRIDGE

There were two first solos last week and the flying time totalled 37 hr. 30 min.

HANWORTH

Messrs. G. Valentine and R. O. Lindesay went solo last week, during which flying times totalled 18 hr. 45 min. Messrs. K. Buxton and S. Daniels have passed their blind-flying tests. Lt. Cdr. R. N. Charsley has renewed his "A" licence.

YORKSHIRE

Club machines flew twenty-six hours during the week ending March 27, and sixteen hours during the following week. The total for March was 80 hr. 50 min. Mr. L. Bouskill has rejoined the Club as a flying member and Messrs. Tetlow and Greaves have become associate members.

ROYAL AIR FORCE

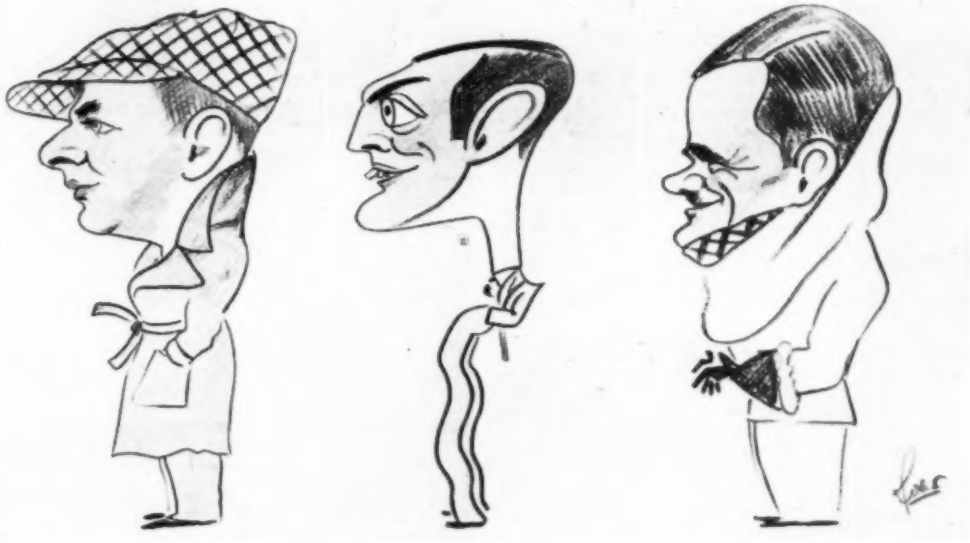
His Majesty King Edward VIII has graciously consented to continue, as King, the Patronage he gave the Royal Air Force Flying Club as Prince of Wales. Owing to the international situation the formation of the Egyptian branch has had to be postponed indefinitely. The Tiger intended for that branch will shortly come into operation at Hatfield. F/O. P. H. Maxwell recently joined the Club.

WITNEY AND OXFORD

The weather limited last week's flying time to sixteen hours. The total for March was sixty hours. Mr. G. R. Beale-Browne has become a pilot member and Mrs. Beale-Browne an ordinary member. Mr. J. Brain passed his "A" licence tests. A very successful performance of *The Late Christopher Bean* was given by the Witney Aerodrome Dramatic Society in the Corn Exchange, Witney, on March 28.

A.S.T.

Although the flying time for March did not exceed that of the previous month, the figure was 1,325 hr. 40 min. The scope of the school has been greatly extended by the completion of the new hangar and increases in the staff. Capt. G. F. Meager, A.F.C., A.F.R.Ae.S., an instructor from the R.A.F. School of Navigation, joined the staff as a navigation lecturer and assistant to the chief ground instructor. During the month Major Vetch returned for a refresher instructors' blind-flying course and Capt. Murdoch of South Africa joined for the Navigation Course. Mr. P. Carter, of Durham University, joined for Ground Engineers' training. Mr. R. Grubb obtained his blind-flying certificate, and Mr. Nylund, of Norway, and two British pupils their "A" pilots' licences. One "B" pilot's licence was obtained and three R/T licences. A few civilian pupils are arriving immediately after Easter and in May the new term for the long aviation course begins.



AN INSTRUCTIONAL TRIO: Regular visitors to the Brooklands Flying Club will have no difficulty in recognising the original victims of these three caricatures by a Dutch artist, Mr. Van Stokkum. They are, of course, Capt. Duncan Davis, the managing director, Mr. Ken Waller, the chief instructor and Mr. E. H. Alliott, one of the instructional staff.

Private Flying

PORTSMOUTH

For the week ending April 3 the Portsmouth Aero Club flew 11 hr. 5 min., the low total being due to bad weather. Sir Charles Rose, Bt., the managing director, took delivery of his new machine —a Percival Vega Gull—last Saturday.

REDHILL

A door-to-door taxi trip was made last week on the Autogiro, the destination being a remote farm in Gloucestershire. Messrs. Wrightson and Reed secured blind-flying certificates last week, during which flying times totalled 49 hr. 25 min. C. W. A. Scott's Flying Display will be at the aerodrome on Easter Saturday, but the Club will be closed on Good Friday.

BROOKLANDS

With the return of Capt. Duncan Davis and Mr. Ken Waller, the instructional staff is up to full strength again. With nine machines in the school fleet, all is set for the busy season. The repair department has now moved into its new quarters adjacent to the school hangar so that the whole firm is now housed together. In addition to the hangar there is a new block consisting of dope shop, sewing room, stores, offices and a staff mess room. Mr. Herriz-Smith made the only solo last week, and Mr. Muller-Rowland completed his "A" licence tests. Mr. R. Bulkley, of the College, passed his "A" and "C" ground engineers' examinations, including compass adjustments. On Sunday afternoon a number of members flew to Shoreham to tea, and others to Southampton to look at the *Queen Mary* from the air.

HESTON

The Airwork School has been growing increasingly active as Easter draws near and last week Sir Westrow Hulse completed a first solo on the Old Etonian Club's machine and Mr. Delves, of the Sperry Company, obtained his "A" licence. A D.H. Hornet Moth is proving very popular for cross-country flights under the guidance of Captain Ferguson.

READING

Mr. R. Meuval, from Holland, joined the flying school last week, and Mr. Francis, chief pilot of African Airways, started a blind-flying course. Mr. W. J. Halley completed the tests for his "A" licence. The Club was sorry to say good-bye to Mr. Henry Muller and Mr. Kesserint, who returned to Basle in their Hawk, but welcomed its old friends Mr. and Mrs. Atkey. An order for a Hawk Major has been received from Africa.

RAMSGATE

At the moment, the Thanet Aero Club of Ramsgate Municipal Airport, Kent, is using a 1936 Hornet Moth which will eventually be replaced by a special Miles machine. The flying charges are: Dual 40s., solo 30s. and contract rates. The Club subscription is two guineas. The flying time for March was fifty-four hours. Mr. Chambers took the first "A" licence to be granted at Ramsgate. Fourteen more pupils are undergoing instruction. Work has begun on the clubhouse and main buildings and the hangar is ready. Customs are available daily and there is motor transport for visitors at a reduced rate. The Club is probably the only one in existence to have a qualified parachute jumper on its permanent staff.

The Wilbur Wright Lecture

UNDER the somewhat intriguing title of "Slippery Surfaces," this year's Wilbur Wright memorial lecture of the Royal Aeronautical Society will be delivered by Mr. D. R. Pye, M.A., M.I.Mech.E., F.R.Ae.S., Deputy Director of Scientific Research, Air Ministry

The lecture will be given during a reception which will be held in the Science Museum, South Kensington, on Thursday, May 21. Visitors will be received by the president (Lt.-Col. J. T. C. Moore-Brabazon) and council at 8.30-9 p.m.; the lecture will be delivered at 9.15 p.m.; and the reception will last from 10 p.m. till midnight.

This most important function in the Society's year is held in the unique surroundings of the aeronautical section of the Science Museum and, since this year is the seventieth anniversary of the founding of the Society, a special exhibition of unusual and rare aeronautical items will be shown in the Museum. Ladies are invited and evening dress with orders and decorations will be worn. The band of H.M. Royal Air Force will play.

Applications for tickets (5s. each, including buffet) should be made to the Secretary of the Society at 7, Albemarle Street, Piccadilly, London, W.1.

Living Dangerously

"Flying and Soldiering," by R. R. Money (Ivor Nicholson and Watson, 8s. 6d.).

WHEN Mr. Money is not telling us about how he and his friends got "tight" and how amusing it was, he is a very interesting author. He has had (so far) a very full life, and, with the one exception noted above, he makes a very good story out of it. In the War he was first an observer and then a pilot in No. 12 Squadron, but he was taken prisoner, and did not at all enjoy his time as a guest of the Germans. After the War he rejoined his regiment, the East Yorkshires, and had an interesting time with them in Ireland during the "war of Irish independence." At the time of the Geddes axe he accepted the terms and resigned his commission, but shortly after obtained a Short Service commission in the R.A.F. He spent most of the next five years as an instructor of naval pilots at Leuchars.

Wherever he went he found sport, hunting, shooting, and fishing, and describes it with zest. The main charm of the book lies in the many good stories told, interspersed with some shrewd observations on men, matters, and aeroplanes. Mr. Money ends with a string of reflections, from which we will only extract the following: "Flying is not the safest form of transportation, being indeed the most dangerous, save two: these are walking and cycling; in that order." "Flying is fascinating, but often uncomfortable."

Whitsun at Marseilles

THROUGH the Royal Aero Club, the Aero-Club de Provence has issued an invitation to British private owners to visit Marseilles during the Whitsun week-end.

They will be the guests of the Provence Club from noon on Saturday until the evening of Monday, June 1, and hospitality will include hotel accommodation, petrol and oil.

British private owners wishing to participate are requested to inform the R.Ae.C., 119, Piccadilly, London, W.1.

Non-stop, Too

FOR some time Mr. Tollemache and some friends have been planning an air holiday to Russia and the Baltic. Very recently they set out in poor weather in a hired machine and, after battling with the elements for some two hours, came to earth—at Hanworth. After attempting to explain who they were in pidgin Russian, they lapsed into their mother tongue and later left for Lympne and the Baltic.

The Lowe-Wylde Fund

UP to March 30 the contributions to Lowe-Wylde Memorial Fund had reached a total of approximately £695, the latest donations being as follows:—

	£	s.	d.
R. Exton Gardner, Esq.	10	0	0
P. D. Acland	5	5	0
Morris Jackaman	3	3	0
G. L. Baker	3	3	0
Air Vice Marshal A. E. Borton	2	2	0
C. R. Anson	1	10	0
Lissant Beardmore	1	10	0
Nigel Tangye	1	10	0
E. Bradshaw	1	10	0
W. B. Wells	1	10	0
C. R. Millbourn	1	1	0
F. G. L. Bertram, C.B.E.	1	1	0
R. L. Bowes		10	6
Harold Heath		10	6

The objects of this very deserving fund were reiterated on p. 303 of *Flight* of March 19.

Modern Complications

THAT the test pilot of to-day has no sinecure is fairly obvious to everyone who considers the number of devices which must be tried out in the modern high-speed machine. Mr. K. G. Seth-Smith, of General Aircraft, in the paper which he read before the Students' Section of the R.Ae.S. on Tuesday of last week, brought the fact firmly to light when he gave a very rough-and-ready indication of the normal procedure before taking off.

"Ensure that the undercarriage is locked in the down position; ensure that the flaps are up; check the airscrew pitch changing mechanism to ensure that all airscrews are in fine pitch; check the cylinder head temperatures; and check the position of the intake temperature control." Then the pilot must fly on a combination of boost pressure and engine revolutions so that, as the machine gathers speed, the throttles can be closed a trifle in order that the boost pressure shall not become dangerously high.

In the course of his paper Mr. Seth-Smith gave an interesting, if not strictly accurate, explanation of the usual reason for tail vibration. This occurs, he said, when the rear portion of the fuselage has the same frequency as that of the "rollers which are caused by the airflow over the main plane." The designer endeavours to keep these frequencies as far apart as possible.

THAT ELUSIVE "ULTRA-LIGHT" IDEAL

By W. BODDY

In This Controversial Article the Author Maintains That There is a Good Market for the Ultra-light Type of Aeroplane Built to Certain Ideals, and Quotes Some Interesting History from the Lympne Trials

M. MIGNET, with his *Pou-du-Ciel*, has certainly brought the possibilities of really economical flying very much into the limelight. Naturally enough, those who do not consider that the *Pou* in itself constitutes the next step towards the ultimate realisation of "aviation for the million," are tempted to outline their own ideal flying machine of ultra-low power. Certain of these idealistic designs have found their way into print; many more have been merely plotted verbally over the bar counter.

The remarkable thing is that there should be anything at all original in an aeroplane of less than fifty or so horse-power. I am astonished that really small machines should not have been offered to prospective owner-pilots so long ago that to-day such aeroplanes would be a familiar sight at every civil aerodrome. It seems curious that, while certain enthusiasts are optimistically creating *Poux* in an endeavour to get into the air at any price, hundreds, if not something like a couple of thousand, amateur pilots who have qualified for "A" licences either have ceased to fly at all or do so at intervals which are of necessity widely spaced, due to the cost of hiring and operating light aeroplanes of existing types.

The position of private flying in this country is much envied abroad, yet it is a fact that at the end of last year, out of 2,980 "A" licence holders, there was a figure for registered, privately-owned aeroplanes as low as 478. It seems to me that here is obviously a potential market, and why no one has exploited it seriously I cannot understand.

Stating the Case

I have already expressed the opinion in *Flight* that the *Pou-du-Ciel* does not meet the needs of these pilots who cannot afford the purchase price and upkeep of existing light aeroplanes; that Flea-building is, in fact, just a craze of the moment. I do not want it to be taken that I belong to the school of thought which pictures the ideal owner-pilot machine as some form of motorised glider. Nor am I suggesting that you can take any existing small aeroplane, halve its motor capacity, and clip its wings to render it sprightly, and thereby present the inexperienced but enthusiastic pleasure pilot with a safe and satisfactory machine suited to his means. But I do maintain that it is either impossible to fly seriously on less than 70 h.p., which is an opinion I have never seen or heard expressed, or else that our aircraft manufacturers have made very little use of some valuable lessons of the past.

The quest for economic flying can be divided into two periods—from the Armistice to 1925 and from 1925 onwards. The former period was markedly one of much

One of the more powerful of the early light aircraft mentioned by the writer—the Westland Widgeon (75 h.p. 5-cyl. Genet). In its original form it had the 36 h.p. Bristol Cherub. (*Flight* photograph.)

experiment and research on behalf of, and intense enthusiasm for, the really low-powered and therefore really economical aeroplane. The following period represented the development of existing types of "light" aeroplane, which development, of course, is still proceeding. The aeroplanes of the pre-1925 era were, I suggest, extremely promising; those of the latter are, we know, thoroughly sound and efficient machines, but unfortunately they happen to be a luxury that a large number of our prospective owner-pilots cannot afford.

As there would seem to be a danger of some other country filching the "formula" for that elusive machine, the "ideal" owner-pilot aeroplane, and of selling the resultant product to our own non-owning pilots, one wonders if some past light-aeroplane history may serve to remind our manufacturers of the latent possibilities of the really economical flying machine, and the lessons that the past can provide in the creation of such a machine.

Very shortly after the Armistice the Austin Motor Company introduced the Whippet, a metal-construction, folding-wing, single-seat biplane of moderate engine-power; and Avro pioneered with the 35 h.p. Baby biplane, in which Hinkler flew from Croydon to Turin in 9¼ hours during May, 1920. Both these machines contained the germ of owner-pilotage, which even then was expected to provide a useful outlet for aeroplane factories smitten with the post-war slump. In 1923, following an epidemic of gliding, this owner-pilot idea began to take hold. The Lympne Contests were announced, and prizes to the extent of £2,600 were offered, the Duke of Sutherland and the *Daily Mail* being the principal donors. The Man in the Street showed some interest. Even in 1923, when motor users were by no means legion and petrol was comparatively dear, a boom in owner-pilotage was predicted for the immediate future, and many other uses were quoted for the baby aeroplane, including that of a training and practice medium for Service pilots.

No fewer than twenty-eight entries were received for the 1923 contests, such well-known firms as Short Bros.,

Avro, de Havilland, Parnall's, Gloucestershire Aircraft, and Handley Page being among those represented. Most of the machines were extremely carefully constructed, while overall weight was kept down to a minimum in keeping with competitive requirements.

Nevertheless, the results are instructive, and not without merit if one recalls the capabilities of high-power craft of this period. They indicated that a speed of over 76 m.p.h., a fuel consumption of 87½ m.p.g., a ceiling of 14,400 ft., and extremely safe landing characteristics were possible on 3½-7½ h.p., albeit not incorporated *en masse* in the same aeroplane. On the other hand, failures and shortcomings proved valuable to those willing to take heed. Hastily converted motor cycle engines displayed, unasked, their ability to cease functioning at the most dangerous moments and with depressing frequency. Although some remarkably slow landings were observed, we were reminded that clipped wings, irresistible as they may be when speed and economy figure in a competition, call for skilful piloting. The general conclusion admitted that 750 c.c. single-seaters could fly strongly—if they did not encounter considerable head breezes. Only one structural failure occurred, which unfortunately cost poor Maneyrol his life. Incidentally, the nine contestants for the fuel-consumption prize averaged between them 57.4 m.p.g., and seven machines that flew the speed competition averaged collectively 62.4 m.p.h. over a course with three turning points.

A Promising Start

This was a distinctly promising start, and when prizes totalling £3,900 were put up in 1924 nineteen machines were ready to repeat the dose. Regulations now demanded two-seaters, but the permissible engine size was only increased from 750 to 1,100 c.c. At least four special power units were now available to competitors, but in view of the limit of 550 c.c. per passenger it is hardly surprising that the results were generally disappointing. But if the performance aspect did not develop as anticipated, some extremely interesting constructional examples were forthcoming, folding or easily detachable wings being stipulated, as in the previous year's ruling. Present-day seekers after the "ideal" may note that Blackburns entered a side-by-side two-seater, Bristols had evolved the all-metal Brownie, and that the Avro Avis had beautifully made wing flap-gear, in which the lower ailerons were depressed by rotation of worm gearing. The Short monoplane had an all-metal (Duralumin) fuselage similar to that of the revolutionary Short Silver Streak, the Supermarine Sparrow possessed worm-controlled variable camber gear, an upswept tail to promote moderate landing speed, and

Representative types of the pre-1926 "ultra-light" era (top to bottom): Avro Avis (38 h.p., 3-cyl. Blackburne Thrush); Supermarine Sparrow (Thrush); Blackburn Bluebird (75 h.p., 6-cyl. Genet)—the first side-by-side two-seater light aeroplane; Parnall Pixie (36 h.p., Bristol Cherub flat twin), seen as a biplane and as a monoplane. Below is the first post-war light aeroplane, the Austin Whippet (50 h.p., 6-cyl. Anzani), designed by Mr. John Kenworthy, who later produced the Redwing seen at the top of the next page. (*Flight* photographs.)

Some more types mentioned by the author. Reading downwards, they are the Robinson Redwing (75 h.p., 5 cyl. Genet); Bristol Brownie (36 h.p. flat twin Cherub)—with metal construction; Avro monoplane (700 c.c. vee-twin Blackburne); and Avro Baby (35 h.p. water-cooled 4 cyl. Green), as flown non-stop to Turin by the late Bert Hinkler. (*Flight* photographs.)

a very low wing-loading, while the very carefully constructed Vickers Vagabond had a most ingenious variable camber gear. The Westland Widgeon had flaps possessing both automatic and camber-varying characteristics.

In view of the progress made in two seasons, these Light Aeroplane Contests might have been expected to have become an annual fixture in the British aviation calendar. And if the organisers had profited from the lessons of 1923-4 and allowed bigger motors, and given the most substantial prize to the best *all-round* performer, then the satisfactory owner-pilot machine might well have come on the market some half a dozen years ago, and been a commonplace product of our leading manufacturers ere now.

But the contests were not continued, and with the introduction of the original 27-60 h.p. Cirrus-engined D.H. Moth in 1925 all interest in the very light aeroplane evaporated, save in a few isolated and unsuccessful instances.

I have the greatest admiration for the light aeroplanes of the sort that followed the Moth, and which by their performance and versatility succeeded in spite of the limitations of the owner-pilot market. But that does not gainsay the lack of interest in more economical machines. The splendid lead set by de Havilland was followed rather blindly by other concerns. The Austin Whippet of 1920 re-emerged as the 80 h.p. Robinson Redwing; the Avro Baby as the Southern Martlet. Avro, Blackburn and other Lympne Contest supporters grew up into Hermes or Gypsy-motored aeroplanes, to be joined by Breda, Spartan, A.B.C. Robin and others. Even the 20 h.p. Klemm and the 40 h.p. Comper were destined to grow up very rapidly.

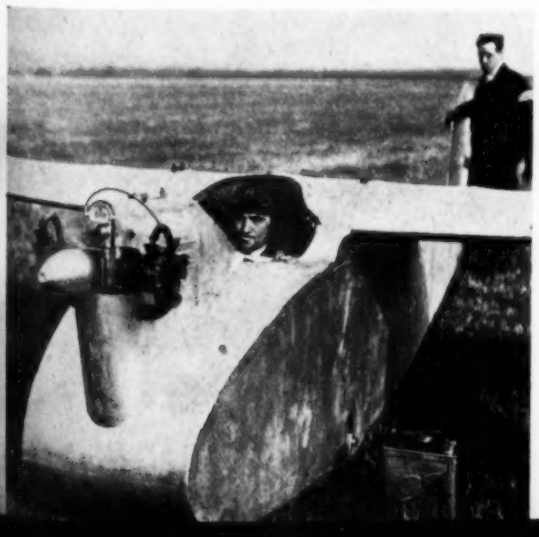
Some Weight Comparisons

Some idea of how we have departed from original standards is evident when it is known that, whereas the laden weight of the 1923 Lympne competitors averaged about 472 lb., and that of the 1924 machines approx. 834 lb., the figure for the light aeroplanes on the British market in 1932 works out at about 1,592 lb. and that for existing single-motor machines up to 200 h.p. at approximately 1,881 lb.

In considering what are and what are not desirable characteristics of the ultra-low-power owner-pilot machine it is unnecessary to go into constructional details, which will be governed largely by manufacturing facilities and designing preferences; suffice it that past history provides much data and food for thought in this sphere. But it is most desirable to decide what performance is called for if the machine is to be a commercial proposition, and to design accordingly, as is now common practice in automobile engineering.

Economy has been stressed, and the machine should sell at around £350 in both single- and two-seater forms when in steady production, while the fuel consumption should not exceed 3 gallons per hour. Expressed in terms of miles per gallon at cruising speed, a consumption of 35 m.p.g. should be aimed at, comparable with the 18-22 m.p.g. of existing machines. In accordance with this fuel consumption a horse-power of around 30 is indicated, and while this power is attainable from quite small units, one with a capacity of 1½-2½ litres is preferable, inasmuch as a reasonable compression ratio and moderate crankshaft speeds are highly desirable. This output of approximately 30 h.p. should be developed at cruising revs, and an ample margin should exist between this speed and the safe maximum. Rating methods are varied, but the motor for our ideal machine would probably be termed a 15/30 or a 20/30, though it might well develop 45 or more b.h.p. at full power.

I rather favour a horizontally opposed, air-cooled unit, but the happenings that can follow valve and ignition derangements in motors of this kind, or at any rate the spectre of such failings, raises a query. So our engine, I feel, should be a four-cylinder, but its actual type, and



(Left) The English Electric Company's Wren, which flew strongly on the power of a 400 c.c. A.B.C. motor cycle engine. (*Flight* photograph.)

The A.N.E.C. (700 c.c. Blackburne vee twin, inverted) and, above, the D.H. 53 (750 c.c. flat-twin Douglas). (*Flight.*)

whether it is to be of special design or modified motor car conception we may leave to the motor experts.

Coming to the question of speed, it is essential to remember that we are planning an aeroplane for existing licence-holders, who will be used to "going places" quite seriously by air, and who are accustomed to flying with an ample speed reserve in hand. A cruising speed of less than 80 m.p.h. will be quite useless, for, pleasant as hedge-hop flying can be, owner-pilots will make frequent trips to the Continent, and will expect to cover greater distances per day as each year goes by. It is vital to bear in mind that the casual "A" licence man will remain a hiring pilot for some considerable time; it is the experienced pilot who seeks to own a private machine, and he will be enabled to go at least twice as far afield as he has done in the past, by reason of low-power economy. Moreover, a reserve of speed is essential, because it will be little fun cruising at 60 m.p.h. whenever a slight head wind is encountered, and still less amusing to fly with the throttle against its stop above the rolling and relentless briny. So I would stipulate a minimum fair-weather cruising-speed of 80 m.p.h., with an additional 10-15 m.p.h. in hand. This should not be impossible, remembering the characteristics of the engine's power-curve (i.e., 30 h.p. at moderate revs with ample r.p.m. margin before full revs), and the fact that the 36 h.p. two-seat Praga E.114 is said to cruise at 80 and attain over 93 m.p.h., the 38 h.p. two-seat Aeronca-J.A.P. gives figures of 87 and 95 m.p.h., and the Belgian Tipsy, of only 540 c.c., has apparently flown at 94 m.p.h.

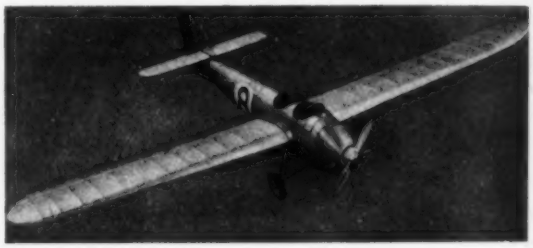
If necessary the engine size of our machine in two-seater form should be increased to give these speeds.

Equally important is it to provide a safe landing speed and reasonably rapid take-off. However undesirable it may be to put a perfectly air-worthy aeroplane down in a small field, your owner-pilot, experienced enough to be completely confident, will make a practice of using a field convenient to the dwellings of his admiring friends and relations, not forgetting that favourite road-house!

The machine which marked the end of the "ultra-light" era and the beginning of a new one—the original 60 h.p. Cirrus Moth of 1925. (*Flight* photograph.)

Power loadings we can control only within limits, but wing-loadings should not exceed a certain maximum figure. If slots and flaps are permissible the issue is simplified, but economical construction will most probably exclude them, at any rate until the market widens to "mass-production" dimensions, and for the same reason there will be a limit to durable lightweight construction, apart from the fact that ultimately compulsory wireless apparatus may complicate matters still further.

It is worth noting that the 1923 Lympne light aeroplanes, in which wing-clipping was to some extent offset by skilful pilotage, and landing characteristics were generally fairly good, had an average wing-loading of approx. 3.74 lb./sq. ft. The 1924 contestants, which were two-seaters, average out at about 4.31 lb./sq. ft. The figure for the original D.H. Moth works out at 5.5 lb./sq. ft., and that for the little Comper Swift with 75 h.p. Pobjoy motor at 9.44 lb./sq. ft. For those modern machines up to 200 h.p. (including the Drone at the bottom end of the scale) for which details are available the wing loading averages 10.78 lb./sq. ft. In spite of the temptation to wing-clip, the machines of the 1923-24 era show a creditably low loading. The Comper, of course, was intended for high-speed work in the hands of experienced pilots, and present-day "light" aeroplanes are intended to operate from "legitimate" landing grounds. Apart from getting down safely into "improvised" aerodromes,



The first light monoplane with all-metal monocoque construction—the Short Satellite (34 h.p. A.B.C. Scorpion Mk II).

the limited engine power of our owner-pilot machine will result in an embarrassing length of run before air-borne speed is attained, and I would impose a limit wing-loading of 6½-7 lb./sq. ft. It is significant that the figure for the 38 h.p. cabin Aeronca is 7.06 lb., and that for the 36 h.p. Praga Baby 6.27 lb., inasmuch as I understand that both machines come-in in a thoroughly satisfactory manner. Arrival at the "ideal" seems a matter of compromise.

From a study of what has been achieved already, I believe the 35 m.p.g., 80 m.p.h., 30 h.p. two-seater to be a commercial proposition. Had the type been sponsored half a dozen years ago it would now be selling strongly; as it is, those makers who get busy straight away should reap the benefit within five more years.

Detail design will depend largely upon manufacturing facilities and individual influences. Certain problems arise. Wings must fold or detach, which is not easy to arrange. Undercarriages should be planned to resist heavy landings, and be wide enough to keep the machine stable on windswept landing grounds where outside help is not forthcoming.

Cabin comfort will be looked for, yet clear vision, ample space and freedom from fumes must be provided. Luggage lockers should be weatherproof and able to accommodate holiday impedimenta such as fishing tackle and golf clubs. Controls, particularly on single-seaters, should follow the arrangement of those in existing trainer-types. Control characteristics in the air would be a study in themselves. Motor and air-frame design should facilitate maintenance.

Let us hope that British manufacturers will go ahead and show the world that we can be as invincible in respect of small aeroplanes as we are accepted to be in the market for small cars.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

NOMENCLATURE OF FURY AIRCRAFT

Certain Fury aeroplanes now in course of construction will be fitted with full-power Kestrel V engines and composite cooling system. This type of Fury aircraft will be known as Fury II. The existing form of Fury, fitted with Kestrel IIS, or de-rated Kestrel VS, engines will in future be known as Fury I.

PERMANENT AND MEDIUM SERVICE COMMISSIONS

The next examination of short service officers for selection as specialists and the grant of permanent and medium service commissions will be held on November 3 and 4. The following vacancies are offered for competition on this occasion to those desiring permanent commissions by specialisation: Aeronautical engineering, 7; Signals, 3; Armament, 4; Photography, 1; Navigation, 1.

OFFICERS IN CIVILIAN POSTS

A number of retired officers of the Army and R.A.F. who are serving as civilian assistants at various stations, for duty as adjutants or technical and stores officers, have been granted commissions in the Reserve of Air Force Officers, class C, in the ranks they formerly held, or equivalent ranks.

This gives them the status of a subordinate commander such as they would not carry if appointed solely on a civilian basis.

FORMATION FLYING

It has been found that, when a formation breaks up before landing, there is some confusion and consequent risk of collision unless the order in which the respective sub-formations or individual aircraft are to land has been previously arranged. It has therefore been decided to lay down as standard practice that, unless specific orders to the contrary have been given by the formation leader, sub-formations or individual aircraft breaking formation before landing are to land in the following sequence:—(i) Leading sub-formation or individual aircraft. (ii) Starboard sub-formation or individual aircraft. (iii) Port sub-formation or individual aircraft.

AIR RAID PRECAUTIONS

Major H. S. Blackmore, formerly medical officer in charge of air raid precautions for the St. John Ambulance Brigade, has been appointed medical officer to the Air Raid Precautions Department of the Home Office. Major Blackmore will be responsible for the co-ordination of medical services which the department, set up nearly a year ago, has in preparation. He will give lectures to doctors and nurses. During the war Major Blackmore served with the R.A.M.C., and from 1922 to 1927 he was attached to the Chemical Warfare Research Department of the Home Office.

AIR ATTACHES' ALLOWANCE

An amendment to the King's Regulations and Air Council Instructions provides that in addition to the pay of their substantive rank air attachés will be granted a foreign allowance at the following daily rates, which will be liable to revision in the event of material variation in the cost of the items covered by the allowance:—

Air attachés at Berlin, £4; Brussels, £2 10s.; Buenos Aires, £4 10s.; Helsingfors, £2 10s.; Moscow, £2 5s. (plus free furnished accommodation); Paris, £4; Prague, £2 15s.; Rome, £3 11s. 3d.; Shanghai, £3 10s.; Tokyo, £4 5s.; and Washington, £5. Assistant Air Attachés at Berlin, £2 10s.; and Santiago, £2 12s. 6d.

THE "SHADOW" INDUSTRY

In a written reply to a question the Under-Secretary of State for Air stated that the erection and equipment by two leading firms of motor-car manufacturers of supplementary aircraft factories or extensions will as a rule be financed by H.M. Government and both shops and plant will remain Government property. Both in selecting these firms and siting the factories all relevant considerations have been and will be taken fully into account, including the strategical necessities and the fair division of economic activity. It will, however, be essential in most cases on economic, technical, and administrative grounds that the actual factories should be situated within reasonable distance of the main existing works.

ROYAL UNITED SERVICE INSTITUTION

The Royal United Service Institution announces that, as a temporary measure and to enable as large a number of officers as possible to avail themselves of the facilities offered by the institution during the period while His Majesty's forces are being increased, the entrance fee has been suspended. Officers of all ranks whose names appear in the Air Force List can, therefore, join the institution by paying the annual subscription of £1 5s. only. Membership will date from January 1, 1936.

OFFICERS OF THE JEWISH FAITH

The Rabbi Dayan M. Gollop, B.A., the Senior Jewish Chaplain to H.M. Forces, 13, Fawley Road, West Hampstead, London, N.W.6, has requested information concerning officers of the Jewish Faith serving in the Royal Air Force.

All officers of the Jewish Faith therefore are requested to communicate with the Secretary, Air Ministry, quoting reference number 503192/36/S.7(*b*).

ANOTHER MECHANICAL TRANSPORT STORAGE UNIT

A temporary M.T. storage unit to accommodate approximately 300 vehicles formed at No. 2 Stores (Ammunition) Sub-Depot, Pulham, on March 16, 1936.

The unit will come under the command of the Officer Commanding, No. 2 Stores (Ammunition) Sub-Depot, Pulham. For pay and stores accounting purposes it will be administered by the Officer Commanding, No. 1 M.T. Storage Unit, Hendon.

TARGET-TOWING

Target-towing practice is being carried out by aircraft of the Anti-Aircraft Co-operation Flight in the area enclosed by a line joining Biggin Hill-Stansted-Maidstone aerodrome-Westerham-Biggin Hill during the period April 1 to June 30, 1936, inclusive. Towing will only take place in daylight and in good visibility with a cloud base not below 2,500 feet above sea level. Furthermore, the towing aircraft will not fly within less than 1,000 feet of the cloud base. The length of tow will not exceed 1,000 feet.

FLYING ACCIDENT

The Air Ministry regret to announce that, as the result of a collision in the air at Ponton, Grantham, on April 2, 1936, between two aircraft of No. 3 Flying Training School, A.P/O. Geoffrey Clive King George and L.A/C. Percy James Pugh lost their lives. They were the pilots and sole occupants of their respective aircraft.

CHANGES IN SERVICE UNIFORM

The Air Ministry announces:—

Important modifications in the Service uniform of officers and airmen of the Royal Air Force, which was introduced shortly after the Great War, will be made in the near future. The changes have been decided upon as a result of observation and trials which have shown that the comfort and efficiency of the personnel will be materially enhanced thereby.

The most important change common to both officers and airmen is the abolition of breeches and puttees; officers' field boots are also to be abolished. Trousers will in future be worn on all occasions by all ranks. A blue web gaiter has, however, been approved for use in inclement weather.

A blue Field Service cap, similar in shape to that worn by the Royal Flying Corps, has been adopted for all personnel. It will be worn regularly on normal duties at Royal Air Force Stations and elsewhere, and can be adapted for use as flying helmet when so desired. The present round peaked cap is being retained for ceremonial and other appropriate occasions.

Airmen will be supplied with an open-neck jacket instead of the close-fitting type; with it they will wear a blue-grey collar and a black tie. This is similar to the dress already authorised for sergeants.

In future, officers will wear a blue shirt and semi-stiff collar to match. The black tie will be retained but the present stiff white collar and soft white shirt will disappear. The changes in officers' dress will be introduced as from May 1st, but the order will not be compulsory until September 1. In the case of airmen arrangements are being made for new issues to begin from about the latter date.

ROYAL AIR FORCE GAZETTE

London Gazette, March 31, 1936

General Duties Branch

Air Vice-Marshal W. R. Freeman, C.B., D.S.O., M.C., is appointed Air Member for Research and Development, on the Air Council, vice Air Marshal Sir H. C. T. Dowding, K.C.B., C.M.G. (April 1); Lt. B. H. M. Kendall, R.N., is reattached to the Royal Air Force as a Flight Lieutenant, with effect from March 10 and with seniority of January 1, 1934.

The following Flight Lieutenants are promoted to the rank of Squadron Leader (April 1):—F. E. Vernon, W. M. M. Hurley, L. Martin, G. Harcourt-Smith, G. H. Mills, C. C. Bazell, A. D. H. Foster, J. L. Wingate, R. N. Waite, E. A. C. Britton, D.F.C., J. S. Harrison, J. Bradbury, D.F.C., T. B. Bruce, M.C., C. B. Wincott, J. Silvester, J. R. Wolley, N. V. Moreton, T. H. French, D.F.C., J. C. E. A. Johnson, D. S. Allan, J. W. Jean, D.S.M., A. Hesketh, D.F.C., F. F. Inglis, C. L. Falconer, L. de V. Chisman, M. W. C. Ridgway, C. J. Collingwood, D.F.C., R. C. Wansbrough, C. E. N. Guest, E. B. Addison.

The following Flying Officers are promoted to the rank of Flight Lieutenant:—J. B. S. Monypenny (February 27); P. J. Polglase (March 12).

The following Pilot Officers are promoted to the rank of Flying Officer (January 28):—J. E. Kirk, H. J. Hobbs, K. E. Cornabé.

Sub-Lt. K. W. Ross, R.N., Flying Officer R.A.F., ceases to be attached to the Royal Air Force on return to Naval duty (March 20); the short service commission of Acting Pilot Officer on probation V. D. H. Elkington is terminated on cessation of duty (March 24).

Stores Branch

The following Flight Lieutenants are promoted to the rank of Squadron Leader (April 1):—W. J. Cleasby, D. W. Dean, E. C. Farman.

Accountant Branch

W/O. H. E. J. Acfield is granted a permanent commission as Flying Officer on probation with effect from and with seniority of March 16.

The following Flight Lieutenants are promoted to the rank of Squadron Leader (April 1):—V. G. A. Bennett, W. W. Deane, G. W. Lynn.

Sqn. Ldr. H. G. Bushell resigns his permanent commission (March 29).

Medical Branch

Flt. Lt. W. Hall, M.B., Ch.B., M.R.C.S., L.R.C.P., is transferred to the reserve, Class D (March 27).

Commissioned Engineer Officers

The following Warrant Officers are granted permanent commissions as Flying Officers on probation with effect from and with seniority of March 18:—W. H. King, A. J. Nicholas, A. C. Outway, J. K. Tough.

Commissioned Signals Officer

W/O. F. W. Aggett is granted a permanent commission as Flying Officer on probation with effect from and with seniority of March 18.

Commissioned Armament Officers

The following Warrant Officers are granted permanent commissions as Flying Officers on probation with effect from March 18 and with seniority of the dates stated:—L. A. Bett (March 18); A. J. Richardson (March 23).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

F/O. H. H. S. Scott, D.S.M. (R.A.F. Retired), is granted a commission as Flight Lieutenant in Class C (March 5).

The following Flying Officers are transferred from Class A to Class C:—B. A. Blythe (October 10, 1935); R. V. Redpath (March 2).

Flt. Lt. H. N. Hawker relinquishes his commission, and is permitted to retain his rank, on appointment to a commission in the South African Air Force Special Reserve of Flying Officers (January 18); Flt. Lt. G. H. Allison relinquishes his commission on completion of service and is permitted to retain his rank (December 12, 1935).

The following Flying Officers relinquish their commissions on completion of service (March 16):—J. R. M. Brunton, V. B. Twiss.

F/O. H. M. Gahan relinquishes his commission on appointment to a commission on the Unattached List for the Indian Army (February 12).

AUXILIARY AIR FORCE

General Duties Branch

No. 601 (COUNTY OF LONDON) (FIGHTER) SQUADRON.—Sqn. Ldr. R. G. Shaw, D.F.C., relinquishes his commission and command of the squadron on completion of service (February 1).

No. 608 (NORTH RIDING) (BOMBER) SQUADRON.—A. S. Johnson is granted a commission as Pilot Officer (February 17).

AUXILIARY AIR FORCE RESERVE OF OFFICERS

General Duties Branch

R. G. Shaw, D.F.C., is granted a commission as Squadron Leader in Class A (February 1).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Group Captain.—L. F. Forbes, M.C., to No. 1 Flying Training School, Leuchars; to command vice Group Capt. L. J. E. Twisleton-Wykeham-Fiennes, 16.3.36.

Wing Commander.—P. B. Hunter, to Headquarters, Western Area, Andover; for Equipment (Engineer) Staff duties, 19.3.36.

Squadron Leaders.—G. S. N. Johnston, to No. 7 (B) Squadron, Worthy Down, for flying duties vice Sqn. Ldr. C. E. W. Foster, 23.3.36. H. G. Rowe, D.F.C., to D.T.D., Dept. of A.M.R.D., Air Ministry, vice Sqn. Ldr. J. Bussey, 24.3.36. T. M. Williams, M.C., D.F.C., to D.O.I., Dept. of C.A.S., Air Ministry, vice Sqn. Ldr. G. S. N. Johnston, 23.3.36. H. T. Lydford, A.F.C., to Royal Air Force College, Cranwell; for Flying Instructor duties, 20.3.36. S. McKeever, D.F.C., to No. 7 Flying Training School, Peterborough; for flying duties in Advanced Training Squadron, 20.3.36. I. E. Brodie, to Headquarters, R.A.F., Iraq, Hinaidi; for Armament duties vice Sqn. Ldr. C. W. Busk, M.C., A.F.C., 18.3.36. J. L. M. de C. Hughes-Chamberlain, to Aircraft Depot, Hinaidi, Iraq; for Administrative duties vice Sqn. Ldr. J. F. Gordon, D.F.C. 18.3.36.

Flight Lieutenants.—G. Bearne, to No. 1 Air Defence Group Headquarters, London, 24.3.36. A. W. B. McDonald, to No. 32 (F) Squadron, Biggin Hill, 19.3.36. D. M. T. Macdonald, to No. 1 (Indian Wing) Station, Risalpur, 28.1.36. J. D. Baker-Carr, to Headquarters, Western Area, Andover, 26.3.36. A. C. Mitchell, to No. 9 Flying Training School, Thornaby, 30.3.36.

Flying Officers.—O. H. D. Blomfield, to R.A.F. Station, Gosport, 21.3.36. H. McC. White, to No. 20 (A.C.) Squadron, Peshawar, India, 24.2.36. A. R. Glencross, to No. 8 (b) Squadron, Aden, 18.3.36. A. W. Sweeney and C. W. Williams, to Royal Air Force College, Cranwell, 30.3.36. M. B. Hamilton, to No. 1 Flying Training School, Leuchars, 30.3.36. P. S. H. Ross, to No. 2 Flying Training School, Digby, 30.3.36. S. P. Langston, to No. 3 Flying Training School, Grantham, 30.3.36. E. A. Springall, J. F. Stephens, W. P. Sutcliffe, to No. 5 Flying Training School, Sealand, 30.3.36. P. E. Drew, to No. 6 Flying Training School, Netheravon, 30.3.36. S. M. Moseley and L. F. J. Taylor, to No. 7 Flying Training School, Peterborough, 30.3.36. T. F. U. Lang, to No. 8 Flying Training School, Montrose, 30.3.36. J. Grandy, G. A. L. Manton, F. S. Gardner, W. J. Hickey, F. W. C. Shute, to No. 9 Flying Training School, Thornaby, 30.3.36. J. W. B. Judge, to No. 10 Flying Training School, Tern Hill, 30.3.36.

Pilot Officers.—R. G. Forshaw and J. E. Thornton, to R.A.F. Station, Gosport, 21.3.36. J. Duncan, to Aircraft Park, Lahore, India, 18.3.36. J. H. Kitson, to Aircraft Park, Lahore, India, 18.3.36. D. O. Finlay, to No. 54 (F) Squadron, Hornchurch, 16.3.36.

Acting Pilot Officers.—P. G. D. Taylor, to No. 1 Armoured Car Company, Hinaidi, Iraq, 18.3.36. D. H. C. Hull, to No. 104 (B) Squadron, Abingdon, 14.3.36. R. A. Milward, to No. 54 (F) Squadron, Hornchurch, 16.3.36. I. M. Brodie, N. H. des C. Brouard, F. E. Burton, D. L. Davies, P. J. F. Donnelly, G. Drew, D. Ford, D. Genders, D. Perry, T. G. F. Proctor, M. E. Reid, A. W. Ridler, P. J. Young, G. T. B. Clayton, D. T. Collins, F. P. H. Dutton, L. M. Gaunce, R. H. G. Grey, J. F. Roulston, T. Rowland, J. W. C. Simpson, W. D. Sulis, J. L. Sullivan, J. H. Wedgwood, J. M. Downton, P. R. Woodward, all to No. 5 Flying Training School, Sealand, 21.3.36.

Stores Branch

Flight Lieutenants.—M. H. Jenks, to Headquarters, Coastal Area, Lee-on-the-Solent, 23.3.36. E. A. Burridge, to No. 70 (B.T.) Squadron, Hinaidi, Iraq, 18.3.36. E. G. M. Charleston, to No. 55 (B) Squadron, Hinaidi, Iraq, 18.3.36. P. J. Mote, to No. 1 Armoured Car Company, Hinaidi, Iraq, 18.3.36. W. C. Farley, to No. 4 Stores Depot, Ruislip, 23.3.36.

Flying Officers.—A. R. Morton, to Aircraft Depot, Hinaidi, Iraq, 18.3.36. C. D. P. Franklin, to Administrative Wing, Halton, 20.1.36. R. C. V. Ash, to Headquarters, R.A.F. Cranwell, 25.3.36.

Accountant Branch

Squadron Leader.—J. S. Griffiths, to Headquarters, R.A.F., Aden; for duty as Command Accountant vice Sqn. Ldr. R. H. Cleverly, 18.3.36.

Flight Lieutenant.—H. Crowther, to R.A.F. Station, Tangmere, 23.3.36. J. E. Gregson, to R.A.F. Station, Kenley, 30.3.36.

Flying Officer.—E. Bowman, to Aircraft Depot, Hinaidi, Iraq, 18.3.36. B. H. Alder, to R.A.F. Station, Eastleigh, 23.3.36.

Medical Branch

Flying Officer.—C. F. R. Briggs, to No. 1 School of Technical Training (Apprentices), Halton, 24.3.36.

Chaplains Branch

Revd. J. H. W. Haswell, to Headquarters, R.A.F., Iraq, Hinaidi; for duty as Chaplain (Methodist), vice the Revd. S. H. Keen, 18.3.36.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

NO TENDERFOOT : The Noorduyn Norseman is a light transport particularly suited to the Canadian market. Its designer, Mr. R. B. C. Noorduyn, has worked, at various periods, with Fokker (America), Bellanca and Pitcairn. With one of the new 420 h.p. Wright Whirlwinds it does 160 m.p.h. as a landplane with a 1,950-lb. payload. The seaplane version does 146 m.p.h. while on skis the machine is capable of 148 m.p.h.

THE WEEK AT CROYDON

Easter Bookings : A New Company : Control Co-operation : Home with the Milk : Back to the Stone Age : Clothes and the Man

EASTER traffic bids fair, at the time of writing, to be phenomenal, and already advance bookings, notably on Imperial Airways lines, make it desirable for those who want a seat to reserve it at once for the holiday period.

Bookings generally are on the up-grade, and Sunday travel seems to be especially popular. K.L.M.'s Sunday service never seems to leave without a full complement, and the same applies to the inward service. I am told that much more than 50 per cent. of the load consists, as a rule, of long-distance passengers—people, that is, flying to Berlin, Copenhagen, Hamburg, Malmö, Prague and other such places rather than to Rotterdam and Amsterdam.

The other day, when the airship *Hindenburg* was cruising off our coasts, Mr. Holland, of Brian Allen Aviation, went after her in search of photographs. The story in the newspapers that he had to fly at 150 m.p.h. to overtake the airship is romantic and true, in a way. The ship was a very long way off when he saw her, so he flew fast. When he came alongside he found she was making about 30 m.p.h. I see, by the way, that she carried a motor car on board. Those who don't like airships might think that a boat, preferably a lifeboat, would be better.

For some time we have been accustomed to the buzzing around our ears of the Drone belonging to Lt. Cdr. Dove, and when Lord Sempill flew it away non-stop to Berlin we quite missed this queer gnat-like little beast. There can be nothing wrong with the efficiency of the creature if it can fly some 600 miles non-stop.

Mr. Paddy Flynn, well-known Croydon character and pilot of Imperial Airways until an accident in 1930 caused the loss of a leg and various other injuries, has at last achieved an ambition he has cherished since that time. He has now formed his own company for flying instruction and other activities. He is, incidentally, probably the only one-legged pilot with an instructor's licence.

Paddy proposes to operate at Croydon, at another aerodrome near London and in the North of England. Having had his share of bad luck, which included (as well as an amputated leg) a fractured spine, five fractures in the other leg and some broken ribs, he deserves all the good luck that his numerous friends would wish for one who has kept smiling through such a lot of adversity. He joined the R.F.C. in 1916 and served at home and in France until 1921, when he was instrumental in forming, in 1922, the Irish Free State Air Force, which he commanded until 1924. At the time of his accident in 1930 he had carried 31,000 passengers and had 4,700 flying hours to his credit. May he pile up many more hours and carry many thousands more passengers.

Our most regular traveller in these days, Herr von Ribbentrop, arrived after dark one evening, and his pilot, scorning our modest illuminations, landed with both wing-tip flares ablaze. Perhaps it was felt that the time had come for fireworks.

The most illustrious passengers for the week, of course, were the Duke and Duchess of Kent, who left by the Imperial 12.30 machine for Paris *en route* for Yugoslavia for Easter.

Commercial Aviation

There has been quite a lot of Q.B.I. lately, and outgoing morning machines, due off at 8.30 or thereabouts, have been delayed for machines coming in. Irritating though traffic delays undoubtedly are, pilots of all nationalities have put up a very good show in co-operating with the airport control, so much so that the chief aerodrome officer has sent a circular letter to the companies thanking them for it. Little things like this do a tremendous lot to ensure smooth running and really cordial co-operation.

What is the mystery surrounding the very small bottle of milk to be seen outside the Commercial Air Hire and/or Air Dispatch office any morning between 10 and 10.30 a.m.? Does the milkman deliver very late so as not to meet the returning "Dawn Express" people, who may not like to be accused of coming home with the milk, or does he deliver so early in the morning as to be practically the previous evening, for the same reason—and, if so, why does nobody take the stuff in and drink it or give it to the cat or something? Lots of people hate to have to pass a bottle of milk on a doorstep early in the morning.

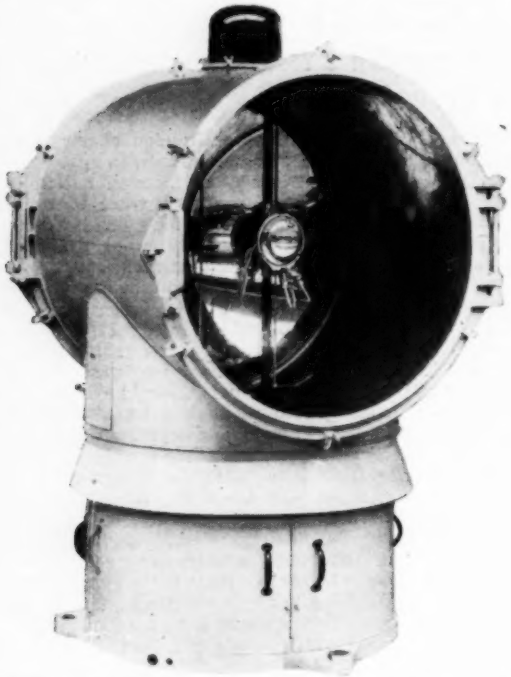
Not long ago I came across a comprehensive article about the modern art of air navigation as accepted and practised by all the leading air traffic companies. Up jumps somebody else to comment on the article, and appears to be attempting to show that reliance on instruments of one sort and another is a most dangerous tendency. So, no doubt, was the then-modern tendency to change over from the four-horse coach to the train. The idea behind this dislike of modern methods of navigation appears to result from the instinctive distrust of anything new, which doubtless caused the village elders to scorn the bronze sword and cleave to the stone axe until invaders clove them to the midriff with the newer weapon.

Everybody is entitled to his opinion, of course, but it is, nevertheless, surprising to find anyone virtually recommending a return to Bradshaw-flying just when instrument-flying, the robot pilot and the radio beacon are at last really coming into their own. The matter would hardly require comment were it not for the amazement and laughter it has caused among air-line pilots.

Civil air people, who pride themselves on the smartness of their uniforms, smiled when they saw photographs of the "improved" R.A.F. uniform, which they describe as a cross between Dartmoor and the American marines. Blue web gaiters for inclement weather! Why not pink spats when the sun shines? The only improvement is the blue-grey collar—an idea taken from some of the civil uniforms. Old hands always thought that R.A.F. officers looked half-naked without a Sam Browne belt, which, in black, would have looked really smart. The only redeeming feature was the black field boots, and these are now to be abolished. Trousers, except with full dress, have always been known as slacks, and to the average mind give a definite impression of slackness. What, by the way, do officers do in inclement weather? Stay by the anteroom fire? Surely they are not to be fitted with wrinkled pale blue gaiters to be worn with trousers? A. VIATOR.

Film Distribution

AN ambitious news reel distribution scheme has been announced by Air Commerce in co-operation with Gaumont-British Films. Three main routes will radiate from Heston: one to Newcastle, Edinburgh and Glasgow; another includes Birmingham, Manchester and Stoke; and the third takes in Portsmouth, Bournemouth, Bristol and Plymouth. From these key stations feeder lines will radiate to the smaller towns.



EMPIRE BEACONS: One of a batch of light beacons made by the General Electric Company which are to be used between aerodromes on the Karachi-Rangoon section of the Empire route.

John Grierson Joins P.S.I.O.W.A.

MR. JOHN GRIERSON (who, it will be remembered, contributed an article on the Arctic Air Route to *Flight* of March 19) last week joined Portsmouth, Southsea and Isle of Wight Aviation, Ltd., as a pilot.

His chief duty will be to fly their Fox Moth, a machine of which he has exceptional experience, for he used one—on floats—for his notable Arctic flight in 1934, when, it will be remembered, he carried out a number of radio experiments. The P.S.I.O.W.A. Fox Moth is used a good deal for charter.

Subsidies and "Ramps"

BEFORE the second reading of the Air Navigation Bill in the House several interesting, not to say pointed, questions were asked about subsidies and the like.

Lt. Col. Moore-Brabazon, opposing the Bill, remarked that, since the Air Ministry is a shareholder in Imperial Airways, it helps its child as much as possible as a private company. If anyone, however, who tried to run a service on a purely commercial basis was to receive nothing but discouragement from the Ministry that was a very serious thing.

Mrs. Tate, in support of Lt. Col. Moore-Brabazon, asked why British Continental Airways, which ran a Scandinavian service before British Airways, and which was running a daily service to Antwerp, Brussels and Lille, was never allowed to put forward a tender. Mr. G. Hardie even went so far as to suggest that the science of air travel had been subordinated to financial interests. "All that has been described . . of what man can do in the command of the air has been turned in this House to-night," he said, "into a vision of huge, black, ugly vultures trying to feed upon subsidies."

Mr. Holdsworth, after asking why any company prepared to tender for a regular service should not be given equal opportunities with others which the Air Ministry decides to subsidise, raised the vexed question of bookings. Maj. Neven-Spence asked whether the internal air services were also to receive subsidies where necessary, and said that there was only one direct mail service every week to Shetland, though Highland Airways was being developed and already provided Orkney with a daily delivery.

Mr. T. Johnston asked what steps were being taken by the Government to control the flotation of new financial corporations that were already in being, and whether the Government was prepared to take steps to prevent "the great financial ramps which were already in operation." He mentioned one group by name which, he alleged, was already operating round dummy companies, and compared these workings with the railway and steam power booms.

A full investigation, it is learnt, is to be made by the Government into the Air Ministry's system of granting mail contracts carrying Government subsidies.

Birkett Busy

BIRKETT AIR SERVICE completed seventy-five hours flying during last week—a very good record for this time of year. Not content with photographing "the world's largest liner," one of their machines chased after "the world's biggest Zeppelin" and obtained pictures of her over the Channel.

The Hastings Airport

JUDGING from remarks made by the Mayor of Hastings, Councillor M. Ford, at a recent dinner, the borough's airport will be completed next year. The corporation is spending £50,000 on the work and Councillor Ford suggested that the time had come for a flying club to be formed in order to be ready to occupy the airport in due course.

Ten and a Half Million

COMPLETE 1935 figures are now available for the air mail traffic on the European and Empire routes. Empire mail showed an increase of 73 per cent. on that of 1934. On the European services there was an increase of 46 per cent. It is calculated that nearly 10,500,000 letters were dispatched by air from this country during 1935, comparing with about 6,000,000 in 1934, and about 4,000,000 in 1933.

Weather on the African Route

A CHANGE is being made in the method of supplying weather forecasts to machines on the Cairo-Khartoum route. Hitherto, forecasts for the entire sector have been given from Cairo, but henceforth they will be split to cover two stages. Cairo will forecast Cairo-Halfa and vice versa, and Khartoum will be responsible for Halfa-Khartoum and vice versa. Machines will, in the ordinary course of events, receive their forecasts for the direction in which they are travelling when halted at Wadi Halfa.

Bigger and Better

ALTHOUGH the details are still being kept secret, the main outline of a new commercial airport scheme for Honolulu has been examined. This new land-and-sea airport is estimated to cost about £50,000. It will be built close to the Hickham Field, the U.S. Army's aerodrome now being constructed.

Behind the scheme appears to be the aim to spur development of land machines for future trans-Pacific services, with the idea of increasing the possible payloads.

Radio for the Charter Pilot

A NEW radio transmitting and receiving set, known as the type AD49/50, has recently been developed by Marconi's Wireless Telegraph Co. to supply the need of the private owner or small commercial operator.

The transmitter gives an output of 32 watts to the aerial circuit on C.W. or I.C.W. telegraphy and 22 watts on telephony, and, when working with a modern aerodrome station, telephone ranges of 100-180 miles (160-290 km.) and C.W. telegraphy ranges of 200-300 miles (320-480 km.) can be expected.

The total equipment weight is approx. 62 lb. (28 kg.) when working from either a rotary transformer driven from the 12-volt aircraft lighting equipment, or from a constant speed wind-driven generator. If the wind-driven generator is used for accumulator charging and aircraft lighting the total weight is approximately 80 lb. (36.5 kg.), in which case a separate L.T. charging equipment for the aircraft accumulator is not required. The transmitter, which is extremely compact, works on a waveband of 600-1,000 m. (500-300 kc.) using two valves in parallel to give the necessary "drive," magnifier, and modulator circuits. Frequency stability is stated to be of a high order, and speed is produced by a new method which ensures remarkable quality. Remote control can be used if desired and rapid wave-switching can be carried out to any one of four preselected wavelengths between 800-1,000 metres (375-300 kc.).

The receiver involves a three-valve "straight" circuit, covering a waveband of 600-1,200 m. (500-250 kc.), and is so small that it does not require remote controls, as a corner can always be found for it in any cockpit. For larger machines the equipment can be supplied with a D/F receiver which can work on a fixed frame aerial to give "homing" only, or with a rotatable frame aerial in which a full navigational service is available. Aural or visual indication can be used. In the latter case the installation becomes a complete "radio compass."

Planning for the Future

THE chairman of the committee designed to consider the development of civil aviation in the United Kingdom—commonly known as the "Maybury Committee"—has intimated that it is entering upon the final stages of its proceedings, and that if any organisation or body desires to give evidence it should notify the secretary of the committee at Gwydyr House, Whitehall, S.W.1.

New Soviet Service

A REGULAR air service to connect Izhevsk, the centre of Udmurtia in the Kirov territory, with remote northern regions was opened recently. This line will carry newspapers and mail daily to Sharkansk, Barishnikov, Debes, Karsovai and many other northern cities, villages and settlements.

Mail to Canada

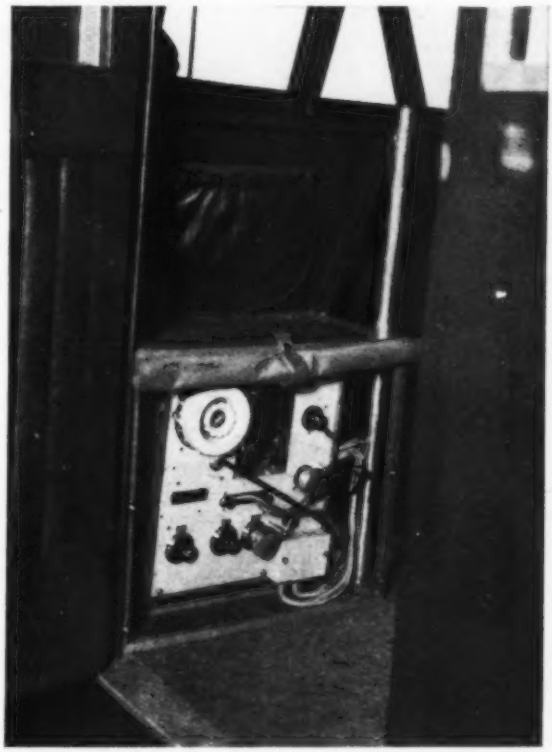
WITH the opening of the St. Lawrence, air correspondence for Canada which is sent by week-end sailings of the C.P.R. steamers from Glasgow or Southampton will again receive onward conveyance by air from Rimouski to Montreal, thereby gaining about one day to Montreal and Ottawa, up to two days to Winnipeg and up to three days to British Columbia. The first despatch for this service will be by the *Duchess of Bedford*, sailing from Glasgow on April 10.

A Meteorological Change

FROM April 1 a slight change has been made in the construction of the wind arrows used in weather maps. This change affects the number of feathers on the arrows, which now show one feather for two steps on the Beaufort scale, and has been adopted by international agreement. Previously one feather was used to indicate one step.

More Traffic for Liverpool

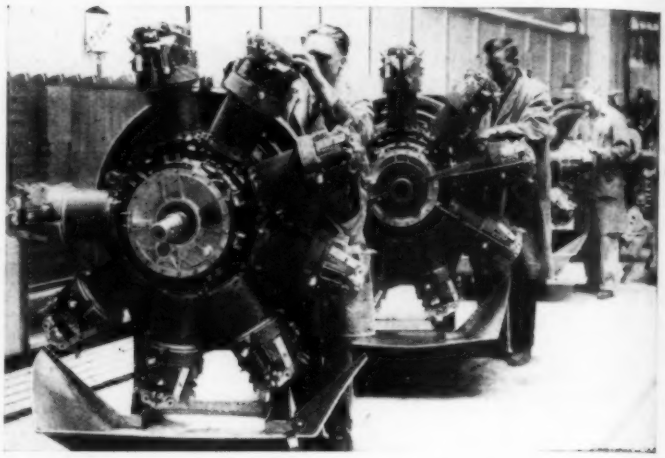
DURING 1935 the airport at Speke dealt with 44,888 arrivals and departures involving 89,297 passengers. These figures are a considerable improvement on those published for the previous year, which were 16,970 and 38,045 respectively. During the twelve months the freight figure had increased from 239,869 lb. to 1,371,098 lb.



The A.D.49 transmitter as installed in a Short Scion, showing the cables and the remote control attachments. This equipment is referred to in the opposite column.

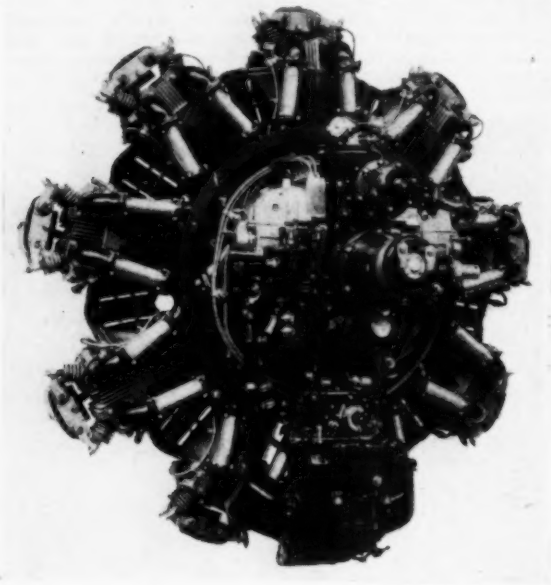
POWER for the EMPIRE BOATS

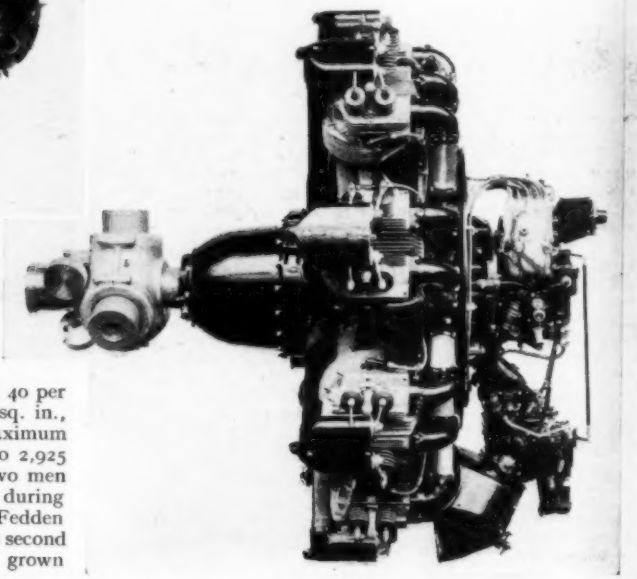
The Bristol Pegasus X.c. : 920 h.p. for a Weight of 1,000 lb. : Supercharger and Variable-Pitch Airscrew : Controllable - flap Cowling to Afford Control of Cooling



Assembling Pegasus X.c. engines preparatory to their being run-in under electric power. (*Flight* photograph.)

WHEN Mr. Roy Fedden produced his first radial engine, built by the Cosmos Company, no one could have foreseen the pitch of efficiency to which that comparatively crude type has been developed. Even during the period since the early Cosmos engines were taken over by the Bristol Aeroplane Co., Ltd., the progress made has been little short of phenomenal. For instance, the first Bristol Jupiter, produced in 1920, developed 350 b.h.p. The Pegasus X.c. has a maximum take-off power output of 920 b.h.p. The power per litre of cylinder capacity has increased, during a period of about fifteen years, no less than 130 per cent. In spite of the introduction of airscrew gearing and supercharging, the specific weight has been reduced 40 per cent., B.M.E.P. has increased from 112 to 185 lb./sq. in., the fuel consumption has fallen 25 per cent. and maximum crankshaft speeds have grown from 1,625 r.p.m. to 2,925 r.p.m. It is interesting to recall that the same two men have been responsible for Bristol engine design during the whole of this development period—Mr. Roy Fedden as chief designer and engineer, with Mr. Butler as his second in command. The technical staff has, of course, grown during the years, and changes have taken place, but the reins of design policy have been in the same hands throughout. Small wonder, in view of these facts, that the name "Bristol" is known and respected throughout the world, and that Bristol engines have been built under licence in a great number of countries.





Rear and side views of the Pegasus X.c. On the back of the engine can be seen the Claudel Hobson carburetter, the Rotax electric starter and the Watford magnetos. The plugs are K.L.G.s. The roots of a De Havilland Variable Pitch airscrew (three-bladed) can be seen in the photograph on the right.

Imperial Airways, Ltd., have used Bristol engines for very many years, and several have completed 5,000 hours of satisfactory running. The selection of Bristol engines for the new Empire flying boats, twenty-nine of which are now being built at the Rochester works of Short Brothers, thus has behind it a long period of experience, and one is justified in assuming that, in spite of the much greater power taken from the new engines, they will prove as reliable as have the earlier types from which they have been developed.

A visit to the Bristol aero engine works last Friday disclosed much interesting information concerning the new Pegasus X.c. engines, more than 150 of which are now

being produced for Imperial Airways, Ltd. The introduction of new fuels of 87 octane value has enabled a greater power output to be obtained, and has resulted in improved fuel consumption, but it has also brought with it difficulties to be overcome. In the main, the Pegasus X.c. is of the same basic design as earlier Bristol engines. It is a nine-cylinder radial air-cooled, with one master connecting rod and eight auxiliary rods. The bore and stroke remain as before, namely, 146.9 and 191 mm. respectively, but detail improvements have been incorporated. A higher compression ratio has been used, the degree of supercharge has been increased, and the crankshaft speed has been raised. At the same time, thrust horse power is high because of the airscrew reduction gearing and the introduction of a two-position de Havilland variable-pitch airscrew. Weight has been kept down to a minimum by the extensive use of light-alloy forgings, a feature introduced by the Bristol Company many years ago. Light-alloy castings, manufactured in the Bristol foundry, are used for a very few parts only, such as the volute casing of the supercharger. Most of the light-alloy forgings are supplied by High Duty Alloys, Ltd., of Slough, and a tour of the Bristol works disclosed the fact that the engines are, almost literally, machined all over. Special tools have in many instances had to be evolved for some of the more complicated processes, and a great deal of money must have been spent on the very up-to-date equipment necessary in the manufacture. The result is, however, that the finished article is a sheer joy to behold, and it was noticed that, in spite of the greatly increased output, Mr. Whitehead, the works manager, has succeeded in maintaining the quality which has always been a feature of Bristol aero engines.

New Cylinder Heads

Among the more important features of the Bristol Pegasus X.c. engine may be mentioned the new type of cylinder head, which has been evolved after extensive research. The fact that in modern times radial aero engines are asked to work inside drag-reducing closed cowlings has increased the cooling problems, and much time has been spent in discovering the best combination of cowl and cylinder-head shape. The new head has deeper and, in some cases, more closely spaced fins, giving a considerably increased cooling area. The cylinder barrels, of hardened steel, have closer pitch finning, so that the total increase in cooling area is over 40 per cent.

Lister trucks are used for transporting the Bristol engines on their special assembly stands from one part of the works to another. Here an engine is being brought along to one of the test beds. (*Flight* photograph.)

Stelliting an exhaust valve for a Pegasus X.c. by means of welding. (*Flight* photograph.)

The pistons, of the full-skirted type developed by the Bristol Company, have been redesigned to provide additional stiffness, and the gudgeon pins have been increased in size. Stellited valve seats and exhaust valves are used, in view of the doped fuels on which the engines will have to run, and the exhaust valves are sodium-cooled.

An efficient combined cowling and exhaust ring of riveted-steel construction has been evolved, and, if desired, controlled cooling can be obtained by the fitting of the new flap cowling produced by the Bristol Company. This consists of a series of separate flaps, the edges of which slide in grooves in the sides of fore-and-aft members, so that when the trailing edge of the cowling is moved outwards by a control in the pilot's seat an unbroken cylinder of metal remains, without gaps between adjacent flaps. Baffles between and behind the cylinders direct the air flow and serve to give even cooling all around the cylinders.

Unit Testing

Much attention has been given to the question of reliability, and a system has been evolved in the Bristol shops by which small parts are first assembled into units and tested as such. The small units are then assembled into larger units and these are tested, and, finally, the larger units are assembled into a complete engine, which is then run in, under electric power, at a speed of about 800 r.p.m. When the running-in period has been completed the engine is returned to a special section of the works, where it is stripped and examined. After reassembly, the engine is put on the test bench for the prescribed runs under its own power. In this connection it is of interest to record that, after completion of the normal civil type test of the Pegasus X.c., the same engine was submitted to a 250-hours' endurance test under economical cruising conditions. The tests started with a fifteen-minutes' full-throttle run to simulate the take-off, and during the cruising power periods the engine was run at the full cruising power of 510 b.h.p., the fuel and oil consumptions being kept within the stipulated figures.

For many years it has been the practice of the Bristol Company to carry out extensive development work on single-cylinder units. In the case of the Pegasus X.c. tests totalled more than 1,000 hours at powers representing maximum output of the complete engine. Normally, of

course, this power is used for short periods only, during the take-off. One result of such extensive tests has been that the Bristol Company is able to offer the aircraft operator and designer no less than 920 b.h.p. for the take-off. In addition to the single-cylinder tests, 3,000 hours of normal development running were carried out on complete engines and 1,000 hours of overload running, giving a grand total of 5,000 hours.

Reference has been made to the assembly of small parts into units and to the testing of such units. This extends to the large quantity of electrical gear used on the new engines. Most of this, it might be mentioned, has been supplied by Rotax, Ltd., and includes electric starters and engine-driven generators. The starters are of the Eclipse direct-cranking type, with hand turning gear incorporated. The generators are of the engine-driven type and give 1,000 watts at 24 volts. They are shunt wound and are used in conjunction with a voltage control box of the Tirril type, which ensures automatic regulation of the output voltage at all speeds. The generator, with its flexible drive, was mounted on a special test rig in the Bristol development department, and completed over 800 hours of full-load running at a generator speed of 6,000 r.p.m.

The 156 engines for the Short Empire boats used more than 60 tons of steel forgings, mostly supplied by the English Steel Corporation, Ltd. This raw material was machined down to a weight of 25 tons of finished components. Nearly all the machining is done in the Bristol shops, with the exception of the airscrew reduction gear, which is supplied in a finished state by the E.N.V. company, another British pioneer aero engine company. Products were to be found in many of the earliest British aeroplanes.

The introduction of variable-pitch airscrews has necessitated a good deal of extra test-bed running, and, in order to simulate as far as possible the conditions actually obtaining in an aeroplane in flight, special test stands permitting the sort of deflections met with in an actual aeroplane have been introduced. In the old days it was customary to mount an aero engine on a very rigid test stand, where nothing short of an earthquake could cause any serious movement. The result was, not unnaturally, that minor defects were not discovered until the engine got into the air. With the new Bristol stands vibrations, torque reactions and similar conditions are accurately represented, and test conditions are very "real." This has a not unimportant bearing on the subsequent reliability of Bristol engines in service. Some idea of the extent of testing on the stands can be formed when it is pointed out that during the 5,000 hours of testing mentioned above 130,000 gallons of fuel were used.

After an afternoon spent at the Bristol engine works one came away with the feeling that, so far from aero engines being expensive, they are actually cheap when one takes into account the money spent on development and the care taken during manufacture. New engine works have been built, and although at Christmas time the new buildings were empty, they are now more than three-quarters filled with machinery and in full production.

SOWING THE SEEDS

—of Trouble-free Landing-ground Maintenance : Some Practical Hints on the Choice of Grasses for Aerodromes : Obtaining a Smooth, Well-knit Surface

By JAMES CLAYTON, M.A.*

THE recent rapid expansion in the number of aerodromes in this country has emphasised very forcibly the fact that there are few sites which, when first located, fully meet requirements as regards landing surface. Most sites require considerable draining, levelling, dressing with suitable fertilisers and seeding with those strains of grasses which have been found most suitable for the purpose.

In choosing a site the following broad principles should be borne in mind:

As a rule, draining a site costs very much more than levelling. Therefore, a low-lying heavy soil site, even if already fairly level, should be rejected in favour of a site possessing freer-working, lighter, easily-drained soil, even though considerable levelling may be necessary. Good drainage is of vital importance, as on no account must the land be allowed to become water-logged. The light or even sandy soils therefore furnish the ideal site, provided a first-class, firm, drought-resisting turf can be established.

Light, sandy soils of loose texture, however, tend to suffer from drought in a dry summer, consequently it is important to see that the seeding consists of varieties of grasses which will not only bind the soil together into a closely-knit green turf, but also will resist drought and hard wear. The grasses commonly used in agricultural practice, *e.g.*, ryegrasses, cocksfoot, meadow fescue, timothy, as well as the large-leaved clovers—which are grown for their heavy herbage production—are of little use for aerodromes. On the contrary, the grasses which give the best results in aerodrome work are the finer-leaved drought-resisting types possessing a strong stoloniferous root system and producing a relatively small amount of herbage. These types give a very hard-wearing, firm turf, bind the soil together, and are capable of surviving where the leafy, succulent agricultural types would starve and die out.

The best are true creeping red fescue and New Zealand bent, to which occasionally, for cheapness sake, may be added fiorin, rough-stalked and smooth-stalked meadow grasses and the dwarf types of ryegrass. The aim should always be to secure a closely-knit herbage of a fine, wiry, small-leaved, hard-wearing nature, with the soil well bound together by a stoloniferous root system, such as is frequently found on sandy seaside golf courses. A turf of this nature gives the maximum resistance to hard wear and a steady braking effect to aeroplanes on landing.

The best results are obtained by sowing from 40 lb. to 60 lb. or even 80 lb. of seeds mixture per acre, in either spring or autumn. The successful seeding of aerodromes is a specialist business calling for an intimate knowledge of grasses and soils, and consequently the best and most reliable sources of supply for the essential grasses should be utilised.

As regards the actual preparation of the seed bed, after the engineering work of draining, levelling, etc., of the site has been completed, the cultivation necessary to produce the requisite tilth should be best carried out by any experienced agriculturist. A necessary preliminary in many cases—more especially on sandy soils—is to see that suitable fertilisers are incorporated in the top soil. It so happens that all the best types of grasses for aerodrome turf formation require comparatively little fertilising, which should, however, be of a *complete* character, *i.e.*, use should be made of compounds containing nitrogen, potash and phosphates in proper balance, and sometimes sulphate of ammonia as well; at the same time, it should be of a lasting nature.

* *Mr. Clayton is an authority on the subject of grasses; he is a director of Edward Webb and Sons, Ltd., the seed specialists, of Stourbridge, Worcestershire.*

London's Airports

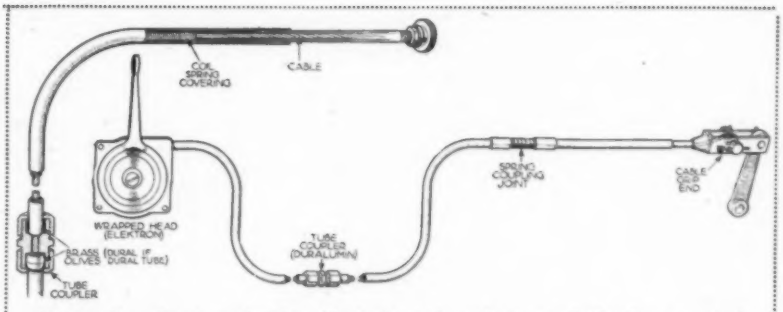
AS far as can be gathered from various reports, it appears that London may eventually have one, or perhaps two, municipal airports. The City Corporation are considering the possibilities of a site on Fairlop Plain, Ilford, which is close to the L.N.E.R. line, while the London and Middlesex County Councils, it is reported, have their eyes on Heston, which also has the G.W.R. line in fairly close proximity. In both cases the demand for building land is complicating the issues.

Cramlington Closed

EARLY next month Cramlington aerodrome, Newcastle, will be finally closed, and Cramlington Aircraft, Ltd., are temporarily suspending their operations. Their address in future will be Moor Buildings, Pilgrim Street, Newcastle-on-Tyne, 1.

POSITIVE CONTROL

The Arens System Described : Wide Application on Modern Aircraft



These self-explanatory sketches illustrate various features of the Arens control system.

THE problem of remote control which presents itself at one time or another to every aircraft designer is solved to a great extent by a positive push-pull system like that produced by Arens Controls, Ltd.

This system, although approved for all controls on aircraft, is mostly used for the operation of throttles, mixture controls, petrol cocks, orientable landing lights and variable-pitch airscrews. The De Havilland type airscrew is fitted as standard with Arens equipment.

Structurally, the control consists of an outer tube, either rigid or flexible, which, if rigid, is first bent to the desired form. An inner member, comprising a closely wound spring having only a few thousandths of an inch clearance, is then introduced into the tube. Within this is a cable, to each end of which is attached a rigid sliding member, the cable being drawn into tension when the unit is assembled. In this manner the push is transmitted by the inner spring member and the pull is taken by the cable.

When a short control is needed it is made as a unit in the Arens works and supplied ready for fitting. Should a long run be required, however (these have been supplied, for aircraft, up to 26ft.), the most convenient method is for the outer tube to be made in sections which can be easily manipulated into the aircraft structure and joined by the unions illustrated. When the outer tube has been positioned, the inner member is passed through and the cable secured by a special cable grip type end, a mechanical joint requiring no soldering thus being made. Lubricant is provided in the form of thin graphite grease which is retained between the coils of the spring. The inner components may be removed and examined in compliance with A.I.D. requirements.

When the system is used for operating a lever a special method of articulating the tube precludes the provision of linkage. In this case a short section of flexible tube is introduced into the outer casing, permitting the tube which carries the sliding member to rise and fall to the arc movement.

A New Bolo?

IT is announced that from Monday, April 6, the Air Member for Research and Development, the Joint Directorate of Scientific Research and Technical Development and the relevant Secretariat Division will be transferred from Adastral House to Savoy Hill House, Savoy Hill, Strand, London, W.C.2. The other directorates of this department will remain in their present accommodation.

In future all enquiries in person to the transferred staff should be made to Savoy Hill House. Official correspondence should, however, continue to be addressed to the Secretary, Air Ministry, Adastral House, Kingsway.

A New Jointing Material

WELL known as makers of "Vellumoid" petrol- and oil-resisting sheet jointing, Chillcots, Ltd., 1-4, Trinity Street, Borough, London, S.E.1, have recently marketed a new jointing material known as "Fibracork."

This consists of high-quality cork sheeting sandwiched between two layers of special petrol- and oil-resisting jointing; the cork is thus given extra strength and is prevented from disintegrating. Intended specially for use in places where a cushioning effect and minimisation of vibration are required, "Fibracork" should find a number of uses in aircraft work, for which it is approved by the Air Ministry. It is made in thicknesses varying from $\frac{1}{64}$in. to $\frac{1}{8}$in.

R.Ae.S. Officers for 1936-7

THE Royal Aeronautical Society states that, as a result of the Council ballot announced at the annual general meeting on March 30, the new Council for 1936-37 will be as follows:—

President, Lt. Col. J. T. C. Moore-Brabazon; past-president, Mr. C. R. Fairey; vice-presidents, Mr. H. E. Wimperis, Maj. T. M. Barlow.

Council: Capt. P. D. Acland, Maj. T. M. Barlow, Maj. J. S. Buchanan, Maj. G. P. Bulman, H. Roxbee Cox, A. H. R. Fedden, A. Gouge, Prof. F. T. Hill, Prof. G. T. R. Hill, Capt. A. G. Lamplugh, W. O. Manning, Maj. R. H. Mayo, R. J. Mitchell, F. Handley Page, Dr. N. A. V. Piercy, Prof. A. J. Sutton Pippard, Lord Sempill, O. E. Simmonds, C. C. Walker, H. E. Wimperis.

Honorary treasurer, Maj. D. H. Kennedy; solicitor, Lawrence A. Lingfield; honorary librarian, J. E. Hodgson; honorory accountant, A. N. D. Smith.

HOMEWARD BOUND: C. J. Melrose, with his Heston Phœnix (Gipsy Six) photographed shortly before leaving for Australia. He had an official send-off from Heston last Saturday, Mr. C. F. G. McCann, Agent General for South Australia, and Mr. Pemberton-Billing (who is Mr. Melrose's uncle), being among the well-wishers. The fact that an extremely adverse weather report thereupon caused a postponement came as rather an anti-climax. Actually, Mr. Melrose left on Monday. He is proceeding Australiawards in easy stages, and on arrival will use the Phœnix for charter work; he will also represent the makers, the Heston Aircraft Co. Ltd. (*Flight* photograph).

A Moth and Hawker Demons of the R.A.A.F. The Australian Demons are equipped for bombing as well as for fighting, carry army co-operation gear such as message hooks, and use the Kestrel V engine.

AUSTRALIA'S AIR DEFENCE

The Present Situation, and Plans for Developing the Royal Australian Air Force : Some Notes by One Who Has Recently Returned from the Commonwealth

THE basis of the Australian Government's policy for air defence, subject to certain modifications which are under consideration, is the report made by Sir John Salmond in 1928. The organisation contemplated under this scheme provides for co-operation with the sea and land forces, for fixed defences and mobile units, for coast reconnaissance and for the protection of shipping, as well as for aerial action against the direct attack of enemy raiding forces.

Priority is to be given to provision for defence against raids. The objective of the Three Years' Programme for the Air Force (due for completion in June, 1937) is practically to complete Part I of the Salmond Scheme, when the following units will be in existence:

Victoria: Headquarters: No. 1 Flying Training School at Point Cook; No. 1 Aircraft Depot at Laverton; Citizen Air Force Squadron for co-operation with the fixed defences; Fighter Bomber Squadron; Bomber Reconnaissance Squadron.

New South Wales: No. 2 Aircraft Depot at Richmond; Citizen Air Force Squadron for co-operation with the Fixed Defences; Army Co-operation Squadron; Bomber Reconnaissance Squadron; Fleet Co-operation Squadron.

West Australia: Citizen Air Force Squadron (to be stationed near Perth) for co-operation with the Fixed Defences.

The Salmond Report has recently been reviewed in the light of additional demands that have arisen from the Navy and Army, and other developments. The modifications involve consideration of several important aspects.

First, as regards naval co-operation, a squadron of twelve aircraft is proposed for the seaplane carrier and cruisers in place of a flight of six aircraft for the seaplane carrier as recommended in the Salmond Report. This expansion takes place during the Three Years' Programme.

Secondly, in view of the recent decision of the Government to concentrate on three of the seven divisions of the Army, three army co-operation squadrons are proposed instead of the one recommended in the Salmond Report. One is provided for in the Three Years' Programme, and the two additional squadrons will be formed later.

The question of co-operation with the fixed defences was not specially considered in the Salmond Report, and a recent review of the scheme for the rearmament of the coast defences also embraced air co-operation. The personnel of four of the five squadrons for this purpose will be taken from the Citizen Force. Two of these squadrons exist in cadre form at present, one is provided for in the Three Years' Programme, and two will be formed later.

Coast Reconnaisance

An important function of the Air Force is reconnaissance out to sea, and the protection of shipping, particularly at focal points and in narrow waters. The Salmond Report recommended the provision of four units each of four flying boats, but these numbers are not sufficient to cover the area over which it will be necessary to provide air reconnaissance for the protection of shipping.

The modern multi-engined landplane is capable of flying with one engine out of action, and is suitable for reconnaissance out to sea as well as for other duties. It is proposed that this type of unit should be substituted generally for the flying boat units recommended by Sir John Salmond, one

unit of the latter to be maintained in view of possible requirements in Papua or other areas where operations from land are not possible.

This alteration in type would, without additional cost, allow of provision in units of twelve landplanes instead of four flying boats, and provide the necessary numbers of aircraft to cover the area required for the protection of coastal shipping.

Accordingly, two coast reconnaissance squadrons, equipped with landplanes, will be provided for during the Three Years' Programme, and three squadrons (one equipped with flying boats) will be formed later.

To the foregoing classes must also be added a certain number of fighter and bomber units, having regard to the other types of squadrons, and their flexibility for other purposes. One of these squadrons is provided for in the Three Years' Programme, and two will be formed later.

Sir John Salmond expressed the view that, on the completion of Part I of his recommendations, the Air Force "would comprise a balanced composite force, which should by its potential offensive power offer a serious deterrent to invasion." The supplementary strength in the revised proposals, and the ultimate completion of Part 2 of the scheme, adds strength to this opinion.

Assuming that naval conditions were favourable for the safe passage to Australian waters of the troop transports of an aggressor attempting an invasion, his convoy would be vulnerable to air attack when nearing this country. One of the deterrent aspects of Australia's field army organisation is the size of the invading force that would be necessary to subdue it, and the larger the enemy convoy the greater would be its vulnerability.

Should the invader reach the coast, his landing operation and establishment of a base would also be a stage at which he was particularly open to air attack, or the location of his landing might be such that he could be opposed only by an air force. It is an axiom that any force landing from the sea against opposition must have local superiority in the air. The corollary to this is that if the defender possesses that superiority, the attacker is not likely to succeed. An enemy air force necessarily operating from ships in these cases would be at a great disadvantage compared with the Australian Air Force operating from shore with its supply and maintenance organisation behind it.

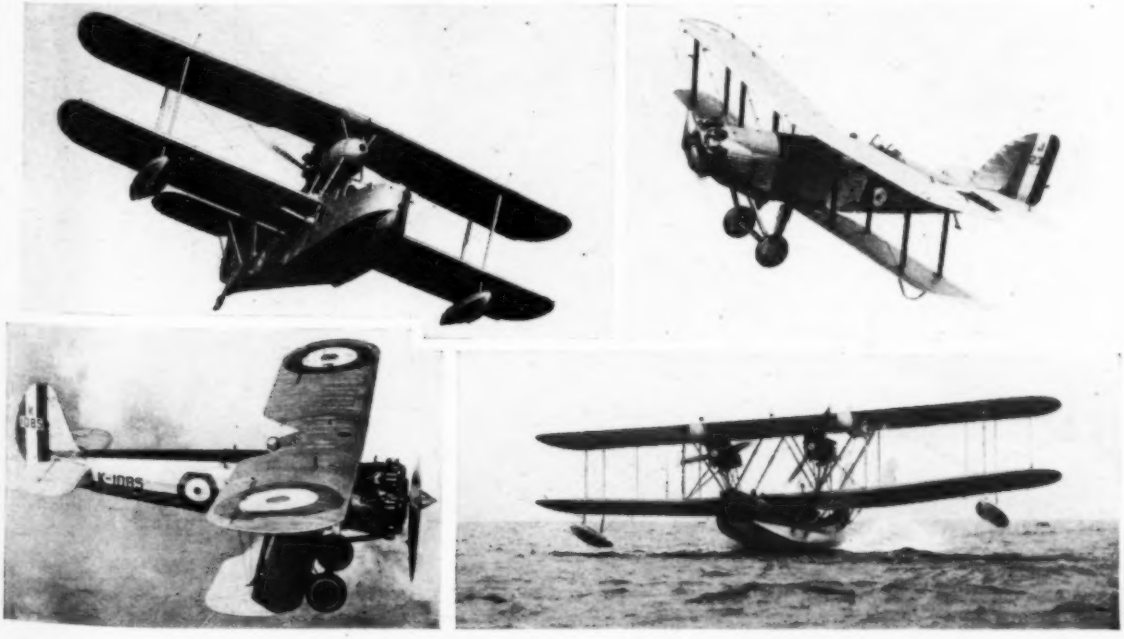
With adequate strength to combat the air force which an enemy might bring to bear, Australia can thus establish a second line of defence against invasion before her field army is called upon to resist an aggressor.

Limitations of man-power and expense will not permit the Commonwealth to maintain large permanent forces, and any military effort organised on an extensive scale must be essentially "citizen force" in nature. The permanent Air Force is therefore the spearhead of her air defence. In any extension of air defence in an emergency, the Government looks to the members of aero clubs and pilots of airway companies, civil aircraft, and the ground organisation for civil flying as valuable adjuncts.

Manufacture in Australia

Considerable reserves of aircraft and engines are necessary for war, and the provision of these during peace in adequate numbers is a costly undertaking. The establishment of the aircraft industry locally on a sound basis would offer a solution of this problem, and greatly improve the present position of reliance on overseas sources of supply which might not be available in war. It is the hope of the Australian Government that before long this important step towards further national self-sufficiency for defence will be accomplished.

Apart from the foregoing, two points struck the writer during his visit to the Commonwealth. One was that British manufacturers are apt to overlook the long distances to be covered in Australia from one station to the next. Machines are needed with high speed and long range—not less than a thousand miles. The second point concerns manufacture of aircraft in Australia, a problem which is receiving a good deal of attention. So far manufacture has not been carried out successfully, though several attempts have been made. On account of the difficulty, in the event of war, of obtaining machines from England, the Government is seriously considering manufacture under licence, not in its own workshops, but by private firms. The problem is a difficult one, as modern machines require to be made in quantities in order to be made economically, and in order to cover the very heavy cost involved.



Four typical types used by the Royal Australian Air Force: The Supermarine Seagull V, Westland Wapiti, Bristol Bulldog and Supermarine Southampton (wooden construction).

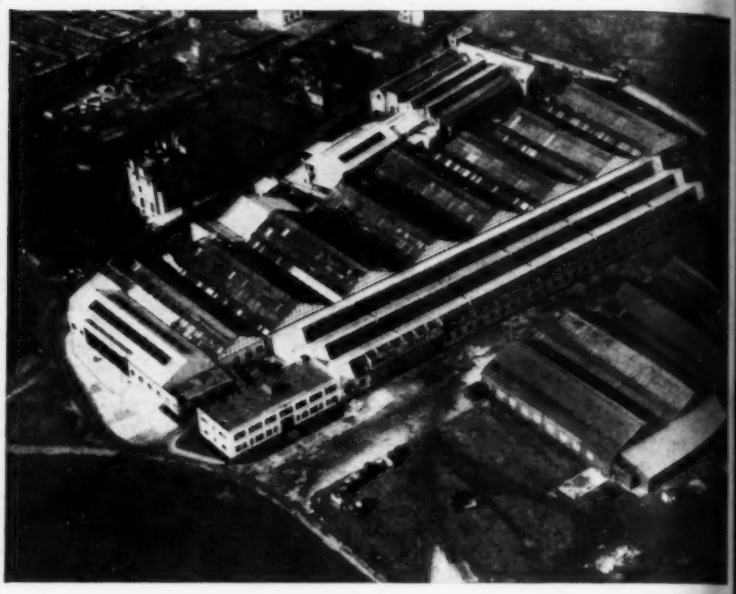
THE INDUSTRY

Blackburn Aircraft as Public Company : Timken Dividend

Blackburn Development

AS reported in detail at the foot of this column, Blackburn Aircraft, Ltd., has been registered as a public company, with a capital of £630,000, consisting of 250,000 5 per cent. cumulative redeemable preference shares of £1 and 760,000 ordinary shares of 10s. each. The company will acquire the whole of the paid-up share capital of the Blackburn Aeroplane and Motor Company and North Sea Aerial and General Transport, Ltd., and will carry on the businesses of the two undertakings (now subsidiaries of Blackburn Consolidated, Ltd., a holding company) as a single operating unit under the present management, with Mr. Robert Blackburn as chairman.

It is understood that the company will shortly be making an issue of 200,000 five per cent. cumulative redeemable preference shares.



CHEZ MONOSPAR : An aerial view of the Hanworth works of General Aircraft, Ltd., with (seen as long glass roofs running laterally) the extensions which have recently been completed.

Diesel Steels

THE latest leaflet issued by Hadfields, Ltd., of Sheffield, deals with steels for use in diesel engines.

British Timken Dividend

THE Directors of British Timken, Ltd., the well-known Birmingham manufacturers of tapered bearings, on March 27 decided to recommend that a dividend of 10 per cent., less tax at 4s. 6d. in the £, be paid for the year ended December 31, 1935. The chairman of the company is Mr. Michael Dewar.

For Better 'Oles

A HANDY bench machine for punching holes of various diameters in sheet metal has recently been produced by Hunton, Ltd., of 114, Euston Road, London, N.W.1, the punches are arranged on a revolving turret and actuated by a lever similar to that on a drilling machine.

With twelve punches, ranging from $\frac{1}{16}$in. to $\frac{1}{2}$in., the Revolving Multipunch Hand Press, as it is known, costs £13 10s.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

BLACKBURN AIRCRAFT LTD. was registered as a public company on April 2 with a nominal capital of £630,000 in 250,000 5 per cent. cumulative redeemable preference shares of £1 each and 760,000 ordinary shares of 10s. each. The objects are to acquire not less than 90 per cent. of the share capitals of the Blackburn Aeroplane and Motor Company, Ltd. and the North Sea Aerial and General Transport, Ltd., and part of the share capital of Loudon Air Syndicate, Ltd., and to carry on the business of manufacturers of and dealers in air and other craft. The first directors are as follows: Robert Blackburn, (director of Blackburn Consolidated Ltd., and Blackburn Aeroplane and Motor Co., Ltd.); Frank A. Bumpus (director of Blackburn Aeroplane and Motor Co., Ltd.); Norman W. G. Blackburn (director of North Sea Aerial and General Transport Co., Ltd.); Reginald R. Rhodes (director of Blackburn Consolidated Ltd., and Blackburn Aeroplane and Motor Co., Ltd.); J. L. N. Bennett-Baggs (director of Blackburn Aeroplane and Motor Co. Ltd.); Humphrey C. Bevan (director of Blackburn Consolidated, Ltd., and H. H. Martin and Co., Ltd.); Edwin Hudson (director of Blackburn Aeroplane and Motor Co. Ltd.). Registered office: Brough, East Yorks.

ATLAS AIR SERVICES LTD.—Private company, registered March 30. Capital £2,000 in 1s. shares. Objects: to carry on the business of manufacturers of and dealers in aeroplanes, aero engines and their component parts; to establish aerodromes, etc. Directors: Lt.-Col. Amos H. Ronan, M.C., 6 College Road, London, W.13; John J. Flynn, 1, Acre Lane, Carshalton, Surrey. Registered office: 101, Aldersgate Street, E.C.1.

AIRCRAFT COMPONENTS LTD. was registered as a public company on March 26, with a nominal capital of £100 in 5s. shares. Objects: to carry on the business of manufacturers of and dealers in component parts, fittings and accessories for aircraft of all kinds, manufacturers of and dealers in aircraft, etc. Registered without Articles of Association. Solicitors: Stephenson Harwood and Tatham, 15, Old Broad Street, London, E.C.

INCREASES OF CAPITAL

BRITISH AERO COMPONENTS, LTD. (Holbrook Lane, Coventry).—The nominal capital has been increased by the addition of £14,900 in £1 ordinary shares, beyond the registered capital of £100.

AIRCRAFT COMPONENTS LTD. (Arle Court, Cheltenham, Glos.).—The nominal capital has been increased by the addition of £199,900 beyond the registered capital of £100. The additional capital is divided into 799,600 ordinary shares of 5s.

AVIATION TRUST MANAGERS LTD. (Palmerston House, Old Broad Street, London, E.C.2).—The nominal capital has been increased by the addition of £30,000 in £1 ordinary shares beyond the registered capital of £20,000.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

(*Published April* 9, 1936.)

25362. ROTHSTEIN, G.: Jet-action systems for utilising the dynamic action of fluids in motion for the propulsion, steering and manœuvring of ships and aircraft (443,963).

18156. THAON, A.: Gyroplane apparatus adapted for road travel (444,085).

20201. IRVING AIR CHUTE OF GREAT BRITAIN, LTD. (Manson, F. G.): Aerial trailers and the like (443,997).

Forthcoming Events

April 13. Aero-8 Club: Easter *Pou-du-Ciel* Rally, Canute Air Park, Ashingdon, near Southend, Essex.
April 16. R.Ae.S. (Coventry Section) Lecture: "Aircraft Instruments," by Mr. J. E. Chorlton, 8 p.m., Armstrong Siddeley Canteen.
April 17. Norfolk and Norwich Aero Club: Annual Dinner and Dance.
April 18. Brooklands Flying Club: Four-club Dinner at the Park Lane Hotel.
April 20. R.Ae.S. Lecture: "New Light on Strength of Materials Afforded by Modern Physics," by Dr. H. J. Gough. Institution of Electrical Engineers.
April 24. Bristol and Wessex Aeroplane Club: Annual Ball.
April 24. Cinque Ports Flying Club: Annual Dinner and Dance, Grand Hotel, Folkestone.
April 28. R.Ae.S. Students' Section Lecture: "Application of Aerodynamics to Mechanical Engineering," by J. L. B. Jones, 7 p.m., R.Ae.S. Library.
May 2-3. *Pou-du-Ciel* Rally, Broadway, Worcestershire.
May 10. R.Ae.S. Garden Party, Great West Aerodrome, Harmondsworth.
May 15-18. Yorkshire Gliding Club: Open Meeting and Competitions.
May 15-June 1. Stockholm Aero Show.
May 23. Empire Air Day.
May 27-June 4. Austrian Aero Club: Whitsun Tour.
June 6. R.A.F. Flying Club: Annual Display.
June 6-14. Czechoslovakia Aero Club: Tour
June 20. Brooklands "At Home."
June 27. Royal Air Force Display, Hendon
July 10 and 11. King's Cup Race.
July 18. Portsmouth Aero Club: Isle of White Race.
August 1-2. Yorkshire Gliding Club: Open Meeting.
September 5-6. Aero Club of Hungary: Week-end Aerien.
Nov. 13-29. Fifteenth International Aero Exhibition, Paris.

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